

THE EXAMINATION OF PRACTICE ENVIRONMENT, BURNOUT, AND MISSED CARE  
ON PRESSURE ULCER PREVALENCE RATES USING A COMPLEXITY SCIENCE  
FRAMEWORK

BY  
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## **Abstract**

**Introduction:** Health-care literature is diverse in studying and addressing the health-care work environment related to safety and nursing. Evidence found in the literature demonstrates that the health-care work environment and patient safety are being studied for the purposes of reducing errors and improving care delivery. Burnout also is a widespread issue among health-care workers. What is not evident in the literature is empirical research related to nurse burnout and missed care and their impact on patient care outcomes.

**Purpose:** The purpose of the study was to determine what influenced the nurse at the bedside to avoid or address burnout and to improve patient care quality and safety. A secondary analysis of data from the National Database of Nurse Quality Indicators<sup>®</sup> (NDNQI<sup>®</sup>) 2011 and 2012 RN Surveys and quarterly clinical data collection was conducted. The study used a sequential regression analysis to examine the relationships among nurse worklife environment, nurse burnout levels, the practice patterns of missed care, and a patient outcome, hospital-acquired pressure ulcers.

**Results:** The linear weighted combination of the variables in the model explained only 1% to 3% of the variance in prevalence rate of pressure ulcers for 2011 and 2012, respectively. Findings revealed that only academic teaching status was significantly related to pressure ulcer prevalence rates in 2011. In 2012, academic teaching status, RN hours per patient day (RNHPPD), and the practice environment subscales (PES) of hospital affairs and quality of care were significantly related to pressure ulcer prevalence rates. Neither burnout nor missed care had direct relationships with pressure ulcer prevalence; however, other environmental factors were related to burnout and missed care.

**Conclusions:** Relationships between environmental factors, nurse burnout, missed care, and pressure ulcer prevalence rates were described in this study, appreciating the influence of hospital level (teaching status, region, size, and Magnet<sup>®</sup> status) and unit level (RNHPPD, skill mix [RNHPPD/THPPD], BS or higher degrees, specialty certification, and total years on unit) parameters. With only a small amount of variance in the prevalence rate of pressure ulcers explained, other relationships among the variables within the model were noted and described. All five domains of the Practice Environment Scale (PES) had significant relationships with the variables (i.e., burnout and missed care) within the model. Most importantly, this was an introduction to proposed future studies that could use complexity science as a framework to appreciate the ever-changing health-care environment and interactions of relationships emerging that potentially impact patient safety and quality.

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## **Chapter I**

### **INTRODUCTION**

Health-care literature is diverse in studying and addressing the health-care work environment related to safety and nursing. Health-care articles report about (a) competency of nurses related to patient safety (Kendall-Gallagher & Blegen, 2009); (b) mitigating a challenging work environment and patient safety (Hughes & Clancy, 2009); (c) nurse staffing patterns related to medical errors (Garrett, 2008); (d) collaboration and patient safety (McKay & Crippen, 2008); and (e) safety organizing concepts related to patient safety outcomes (Vogus & Sutcliffe, 2007). Evidence found in the literature demonstrates that the health-care work environment and patient safety are being studied for the purposes of reducing errors and improving care delivery. Burnout also is a widespread issue among health-care workers (Hansen, Sverke, & Naswall, 2009). What is not evident in the literature is empirical research related to nurse burnout and its effect on patient care outcomes and patient safety (Halbesleben, Wakefield, Wakefield, & Cooper, 2008).

Nurses comprise the largest workforce numbers in hospitals as compared to other health-care personnel, and more nurses employed in the United States work in hospitals than in other health-care facilities (Bureau of Labor Statistics, n.d.). Thus, learning more about burnout among nurses and the effect it has on patient care safety will contribute to improving patient care and patient safety in acute care hospitals. Halbesleben et al. (2008) stated that more understanding is needed regarding how nurse burnout changes patient care. Thus, this study examined nurse burnout in acute care hospitals and explored the impact that nurse burnout had on patient safety.

As researchers continue to study the complexities of the health-care environment, nurses will continue to be exposed to stressful and complex situations. Lambert, Lambert, and Yamese (2003) suggested that stress occurs when demands placed upon a person exceed the available resources the individual perceives to be accessible to manage. Burnout happens in response to stressful situations and occurs when nurses are not empowered within their work environment (Laschinger, Finegan, Shamian, & Wilk, 2003). Factors that contribute to burnout are high job demands and limited or low job resources (Bakker, Demerouti, & Verbeke, 2004).

On a positive note, improvement in the working conditions of nurses was found to be associated with improving patient safety (Stone et al., 2007). For example, research has shown that there are associations among nurse practice environments, nurse job satisfaction, and nurse burnout using hospital-wide measures of nursing outcomes, such as turnover rate of nurses, job satisfaction, and patient outcomes of mortality and failure to rescue rates (Aiken, Clarke, Sloan, Lake, & Cheney, 2008; Estabrooks, Midodzi, Cummings, Ricker, & Giovannetti, 2005; Friese, Lake, Aiken, Silber, & Sochalski, 2008; Tourangeau et al., 2007).

The Institute of Medicine (IOM; 2004) reported serious concerns regarding the health-care work environment of nurses and its negative impact on patient safety. Burnout is a response to work-related stress (Maslach, 1982). The psychological response realized with burnout encompasses emotional exhaustion, depersonalization, and a reduction of personal accomplishment perceptions. Given that the health-care environment is a highly stressful environment and contributes to health-care professionals' stress (Landa, Lopez-Zafra, Martos, & Aguilar-Luzon, 2008), burnout influences health care and patient safety significantly. Halbesleben et al. (2008) reported that the causes of burnout in health care widely have been studied but not the outcomes of burnout. In this study, burnout was associated with a higher

level of perceptions of an unsafe environment, but actual patient errors were not measured or compared (Halbesleben et al., 2008). Burnout also can result in both commission and omission errors (Kalisch, 2006). Commission errors may include marking the wrong side for surgery or administering a wrong dose of medication. Omission errors may include missed nursing care; this refers to any care element that is omitted or delayed either partially or in whole, such as not ambulating a patient or turning a patient as planned (Kalisch, 2006).

Little is known about the impact of nurse burnout on the changes in direct patient care or the missed care that contribute to patient outcomes. More research is needed to understand better what influences nurse burnout, and what directly can improve the quality and safety of patient care that is provided by the nurse at the bedside. Ultimately, the overall desired outcomes include improved patient safety as measured by defined criteria and improved emotional well-being for the nurse in a complex health-care system.

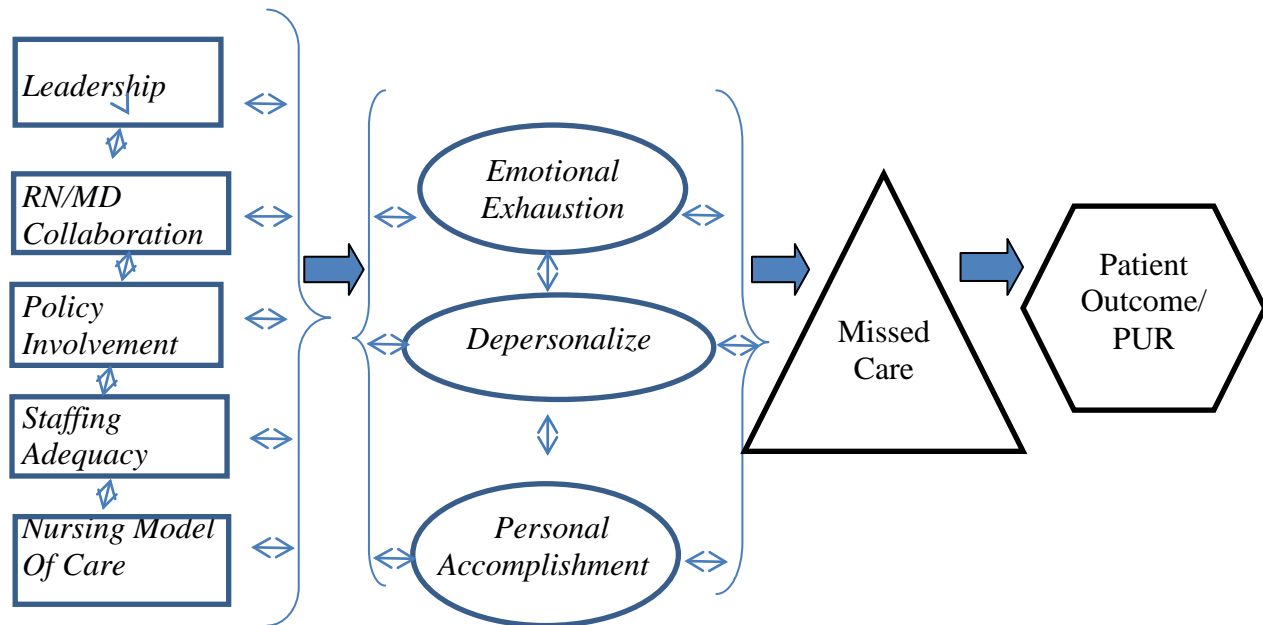
### **Study Objective**

The purpose of the study was to determine what influenced the nurse at the bedside to avoid or address burnout and missed care and to improve patient care quality and safety. The specific study objective was to examine the relationships of environmental worklife indicators, nurse burnout, and missed care with patient outcomes in acute care hospital settings using an adapted model of nurse burnout (see Figure 1). Specifically, nursing and patient data were obtained from inpatient medical-surgical hospital units from the National Database of Nurse Quality Indicators<sup>®</sup> (NDNQI<sup>®</sup>) database.

## Environment

## Burnout

## Patient Safety



*Figure 1.* Modified burnout mediation model. Each factor in the environment (individually and collectively) influences each factor of burnout that, in turn, influences missed care and patient care outcomes. Adapted from “Final Model of Nursing Worklife with Mediating Burnout Role,” by H. Laschinger and M. Leiter, 2006, *Journal of Nursing Administration*, 36, p. 264. Copyright 2006 by Lippincott, Williams, and Wilkins/Wolters Kluwer Health. Reprinted with permission (see Appendix A).

### Primary Aim

As depicted in Figure 1, the primary aim of this study was to determine the relationships between patient care outcomes and these categories: environmental factors, nurse burnout, and missed care. The main research study question was as follows: Controlling for facility variables (i.e., teaching status, size, location, and Magnet<sup>®</sup> status), staffing (i.e., registered nurse [RN] hours per patient day), skill mix (i.e., RN hours per patient day/total hours per patient day), and nurse characteristics (i.e., percent of nurses with a bachelor’s degree, percent certified, average RN tenure), what is the relationship between environmental factors measured by the Practice

Environment Scale (PES; i.e., nurse manager leadership, RN and medical doctor [MD] collaboration, policy involvement, staffing adequacy, and nursing model of care), burnout, missed care, and patient outcomes (i.e., hospital-acquired pressure ulcer prevalence rate).

### **Background and Significance**

Humans believe that they have limited capabilities, and nurses are no different. This, in combination with organizational and environmental complexity, makes human error virtually inevitable in organizations, including those in health care (Wilson, Burke, Priest, & Salas, 2005). Reason (1990) defined human error as any “occasion in which a planned sequence of mental or physical activities fails to achieve its intended outcome either as a result of an inadequate plan or intended actions not going as planned” (p. 4). It has been estimated that each year up to 98,000 deaths occur, and three million patients are adversely affected in the health-care community due to human error (Kohn, Corrigan, & Donaldson, 1999). A basic assumption is that health-care professionals, such as doctors or nurses, do not commit errors intentionally. Causation of errors often is attributed to individuals; yet, in complex environments, causation is multifactorial with individual performance affected by attention deficits (Armitage, 2009). In health-care settings, inadequate work environments have been noted to override the blame placed on nurse incompetence for errors and near misses (Ramanujam, Abrahamson, & Anderson, 2008).

Given that the health-care environment can be highly stressful and can contribute to health-care professionals’ stress (Landa et al., 2008), burnout logically has the potential to significantly influence health care and patient safety. According to Maslach (1982), a social psychologist and the predominant author and researcher on the subject, burnout is a response to work-related stress.

The psychological response of work-related stress described as burnout encompasses emotional exhaustion, depersonalization, and a reduction of personal accomplishment perceptions. Burnout in nurses can be described as emotional and cognitive withdrawal from patients and colleagues; thus, nurses are not responsive to the needs of those they serve. The exhaustion of burnout leads to nurses putting up “walls” and seeing patients and colleagues as impersonal objects in order to distance themselves from human interaction and the needs of others. With the lack of involvement or engaged contact with patients and colleagues, a sense of effectiveness is then difficult for nurses to realize (Maslach, Schaufeli, & Leiter, 2001).

### **Theoretical Framework**

Research has demonstrated links between nurses’ experience of professional burnout and many qualities of work environments (Aiken, Havens, & Sloane, 2000). Leiter and Laschinger (2006) wanted to clarify interrelationships among aspects of complex organizations. Their focus resulted in defining and testing a nursing worklife model that defined structured relationships among professional practice environments and burnout. A causal model was defined and demonstrated support for the factor structure of the Professional Environment Scale of the Nursing Work Index (PES-NWI) and the factor structure of the Maslach Burnout Inventory – Human Services Survey (MBI-HSS; Laschinger & Leiter, 2006). Leiter and Laschinger (2006) provided support for the nursing worklife model, testing for nursing leadership having a fundamental role in determining the quality of worklife and linking to the other four worklife factors: policy involvement, staffing levels, support for a nursing model of care, and physician and nurse relationships. They reported support for a direct negative path from staffing to emotional exhaustion (a component of burnout) and a direct positive path from nursing model of care to personal accomplishment (a component of burnout) in the model. The model testing

confirmed the association of the five domains of professional nursing practice environments with burnout (Leiter & Laschinger, 2006). The burnout mediation quality of the model is described as channeling of all relationships of the work environment variables with adverse events through the three qualities of burnout (emotional exhaustion, depersonalization, and personal accomplishment). This pattern of channeling signifies that qualities of the work environment influence adverse events to the extent that they contribute to feelings of burnout (Laschinger & Leiter, 2006).

The nursing worklife model defined the relationships between professional practice domains and burnout (Leiter & Laschinger, 2006). The model built upon the relationships among the five practice domains of the PES-NWI and the elements of burnout (Leiter, 1993). The model starts with leadership as directly influencing policy involvement, staffing, and physician and nurse relationships. Physician and nurse relationships serve to mediate the relationships of leadership with the nursing model of care and with policy involvement. The nursing model of care influences directly staffing and personal accomplishment (Leiter & Laschinger, 2006). Depersonalization and the relationship with the environment is mediated by exhaustion, which, in turn, mediates exhaustion's relationship with personal accomplishment (Leiter, 1993).

An adaptation to the Nursing Worklife Model (Laschinger & Leiter, 2006) served as the theoretical framework for this study. The model describes relationships among nursing worklife factors (environmental factors), burnout, and patient outcomes. The five environmental (worklife) factors (effective nursing leadership, staff participation in organizational affairs, adequate staffing for quality care, support for nursing model of care, and effective physician and nurse relationships) are the same as described by Lake (2002) that characterize the effective



professional nursing practice environments that interact with each other and affect nurse and patient outcomes through the burnout and engagement process.

For this study, the burnout mediation model of the Nursing Worklife Model (Laschinger & Leiter, 2006) was adapted to include missed care in nursing practice (see Figure 1, p. 4). Kalisch (2006) found that basic nursing care, such as turning or mobilizing patients when needed, is omitted by nurses based on reduced resources and increased demands that the nurse is unable to address. Relating missed care with environmental factors (adequacy of resources and lack of control over policy making) and burnout was described by Kalisch (2006). Thus, missed care was added to the theoretical model for testing to further examine the practice of nurses at the bedside related to the environment, burnout, and patient care outcomes. In the model testing for this study, hospital-acquired pressure ulcer prevalence rate was used as the patient outcome. Testing the adapted model to include missed care for this study will serve as a precursor to testing the full mediation model in future studies.

### **Definition of Terms**

Seven key terms have been selected and defined for the purpose of this study. The terms are bolded and listed alphabetically in the paragraphs that follow.

**Burnout** is the index of the dislocation between what people are and what they have to do. It represents erosion in values, dignity, spirit, and will (Maslach, 1982).

**National Database of Nursing Quality Indicators<sup>®</sup> (NDNQI<sup>®</sup>)** is a national database that provides quarterly and annual benchmark reporting of nurse-sensitive indicators to evaluate nursing care at the unit level in acute care hospitals (NDNQI<sup>®</sup>, n.d.).

**Missed care** is any aspect of required patient care that is omitted (either in part or whole) or delayed (Kalisch, 2006).

**Patient safety** is a focus on patient outcomes, including such concepts as errors or adverse unintended events that could be seen as harmful for patients (IOM, 2000).

**Pressure ulcer prevalence rate** only includes those pressure ulcers that are hospital acquired. A pressure ulcer is any lesion caused by unrelieved pressure, resulting in damage of underlying tissue (National Pressure Ulcer Advisory Panel, n.d.).

### **Summary**

An adapted model of the burnout mediation model (Laschinger & Leiter, 2006) was used (see Figure 1, p. 4) to examine the current health-care environment impact on patient outcomes. The relationships between environmental factors, nurse burnout, and missed care with a patient care outcome (i.e., hospital- acquired pressure ulcer prevalence rates) were examined in this study.

## **Chapter II**

### **LITERATURE REVIEW**

Chapter Two provides an overview of burnout among acute care nurses and a review and critique of the current research linking nurse burnout to patient safety outcomes. Burnout and patient safety are defined, and the history of the tools developed to measure nurse burnout and missed care as an element of patient safety related to nurse practice patterns is reviewed. The prevalence of pressure ulcers was used as the patient outcome focus for this study, and this condition is defined through the review of the literature. A review and critique of what is known and what is yet to be discovered regarding nurse burnout and its effects on patient care is presented in order to develop a model for ongoing research and potential practice changes to improve patient care safety.

#### **Review Approach**

An electronic search of the PubMed, CINAHL, ProQuest, and PsychINFO databases using the search terms *nurse burnout*, *nurse work environment*, *patient safety*, and *patient outcomes* revealed 89 citations. Articles were reviewed using inclusion and exclusion criteria that included the criteria that all articles had to be written in the English language, had to be completed in the United States, and had to be published between 2000 and 2012. To focus on the current knowledge and research, only quantitative, qualitative, and mixed design research studies were included that looked at the work environment variables of nurses and nurse burnout related to the dependent variable of a patient safety outcome. Patient safety was defined to focus on patient outcomes including such concepts as errors or adverse, unintended events that could be seen as harmful to patients.

High levels of burnout in nurses empirically have been shown to distract from the care of and attention to patients that is correlated with patient satisfaction through linear regression (Leiter, Harvie, & Frizzell, 1998; Maslach, 1982; Vahey, Aiken, Sloane, Clarke, & Vargas, 2004). These findings called for changes in workforce factors, such as staffing levels and relationship development between nurses and physicians (Garman, Corrigan, & Morris, 2002).

In accordance with the IOM (2000) report that identified patient safety as patients being safe from harm (i.e., avoiding an outcome such as infection, 30-day mortality, or adverse event report), these examples were used as patient safety indicators for patient safety associated with burnout. Four studies completed in the United States were found using the inclusion and exclusion criteria (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002; Halbesleben et al., 2008; Aiken et al., 2012; Cimiotti, Aiken, Sloane, & Wu, 2012). A fifth study (Laschinger & Leiter, 2006) conducted in Canada was included in this review because of the large number of citations the article received and because of the limited number of studies regarding these phenomena.

Table 1 provides a list of the studies, along with the primary variables used for each study and their definitions. Findings from each of these studies are summarized in the corresponding sections related to the outcome variable of interest.

Table 1

*Summary of Publications with Variable Definitions*

Study	Variable	Definition
Aiken et al. (2002)	Environment: Staffing ratio	Mean patient load per nurse calculated from nurse reported survey data
	Burnout	Measured by Maslach Burnout Inventory (MBI) emotional exhaustion subscale; Cronbach's $\alpha = .90$
	Patient outcome: Patient surgical mortality	Death within 30 days of admission using discharge database
	Failure to rescue rate	Death within 30 days of admission following complication using hospital public reported database
Halbesleben et al. (2008)	Burnout	Measured by MBI emotional exhaustion and depersonalization subscales; Cronbach's $\alpha = .94$ and $.87$ , respectively
	Patient outcomes: Perception of safety	Measured by the Agency for Healthcare Research and Quality (AHRQ) Patient Safety Culture Survey and reported as safety grade and perceptions; Cronbach's $\alpha = .81$
	Patient outcomes: Safety reporting behaviors	Measured by AHRQ Patient Safety Culture Survey and reported as events reports scale and near miss report frequency scale; Cronbach's $\alpha = .87$

(continued)

Table 1 (continued)

*Summary of Publications with Variable Definitions*

Study	Variable	Definition
Aiken et al., (2012)	Practice Environment Scale nurse work index subscale: leadership RN/MD collaboration, staffing adequacy, nurse model, care policy involvement	Measured by the areas of the worklife model; Cronbach's $\alpha$ = .88 - .98
	Burnout	Measured by the MBI emotional exhaustion subscale; Cronbach's $\alpha$ = .93
	Patient outcomes: Perception of safety	Measured by the AHRQ Patient Safety Culture Survey and reported as safety grade and perceptions; Cronbach's $\alpha$ = .81
Cimiotti et al., (2012)	Nurse staffing	Nurse to patient ratio
	Burnout	Measured by the MBI emotional exhaustion subscale; Cronbach's $\alpha$ = .90
	Patient outcomes: Urinary tract infections	Prevalence rate of urinary tract infection patients per 1,000 patients
	Patient outcomes: Surgical site infections	Prevalence rate of surgical infection patients per 1,000 patients

## **Workforce Burnout Model Development**

Maslach (1982), the pioneer in burnout research, used qualitative interviews and field observations to describe burnout as a syndrome that can occur among individuals who do “people work”; burnout is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment. The difference between burnout and job-related stress is that burnout emerges from the lack of social interaction between the helper and the recipient in the situational context of service occupations and their environments. The core dimension of burnout is emotional exhaustion that occurs when an individual experiences fatigue, frustration, and a loss of energy. Depersonalization occurs as a response to emotional exhaustion and is realized when the individual treats a patient or client as an impersonal object. The dimension of reduced personal accomplishment results when employees view themselves negatively and become dissatisfied with their own job performance or achievements (Maslach, 1982).

The early work of Leiter and Maslach (1988), suggesting that emotional exhaustion is a response to job overload, was descriptive and involved interviews of 72 nurses plus support staff in an acute care hospital in California. Depersonalization was identified as a coping response to the emotional stresses of the nurses’ work. Utilizing field observations, Leiter and Maslach were able to see and describe job overload in terms of high patient to nurse ratios, prevalence of negative patient feedback, prevalence of interactions with colleagues and supervisors, and a scarcity of resources. Framing a linear model that was analyzed using regression analysis, Leiter and Maslach found support for the hypothesis that role conflict and interactions with other employees influenced the level of burnout, which then influenced organizational commitment. The foundation of environmental complexity was described as positive and negative interactions between nurses and their patients and colleagues; role conflict was described as job overload and

resource deficits. All of these components influenced the level of burnout in all three dimensions: exhaustion, depersonalization, and personal accomplishment (Leiter & Maslach, 1988).

Empirical studies of burnout began in the 1990s with the use of the Maslach Burnout Inventory (MBI). The MBI measures all three dimensions of burnout identified in the qualitative studies and distinguishes burnout from anxiety and depression (Maslach, Jackson, & Leiter, 2010). Factor analysis was used to establish that burnout is specific to the work context versus anxiety and depression that is evidenced in all facets of a person's life (Bakker, et al., 2000; Glass & McKnight, 1996; Leiter & Durup, 1994). Burnout is more job-related and situation specific than depression (Maslach et al., 2001).

The MBI has been used in more than 90% of all worldwide studies measuring burnout, including those in health care and nursing (Schaufeli & Enzmann, 1998). The current version, Maslach Burnout Inventory – General Services (MBI-GS), can be used with any occupational group and includes all three elements (exhaustion; cynicism, disengagement, or depersonalization; and professional efficacy or reduced personal accomplishment). The MBI is a 22-item tool that scores responses on a 5-point rating scale with fixed anchors on both ends, labeled *never* to *every day*. Higher scores indicate higher levels of burnout. Internal consistency of all three element scales range from .70 to .90, thus being satisfactory. Test-retest reliability is reported as stable at one month and one year with the *r* value reported at .60 to .67 (Maslach, Jackson, & Leiter, 1996). Factorial validity was confirmed for all three factors using linear structural equations modeling, and the three dimensions were interrelated. Convergent validity using peer ratings reports with *r* values greater than .30 confirmed the validity of the tool.



Schaufeli and Enzmann (1998) confirmed reasonable validity as discriminant validity analysis showed that burnout was associated with job dissatisfaction and depression.

Two models linking the definition of burnout to three dimensions (exhaustion, depersonalization, and personal accomplishment) depict the sequential progression of burnout. In one model that was developed through research with human resource staffs in large corporations, depersonalization occurs first, leads to decreased personal accomplishment, and finally results in emotional exhaustion (Golembiewski & Munzenrider, 1988). In the alternative model by Leiter and Maslach (1988), burnout begins with emotional exhaustion, progresses to depersonalization, and finally creates a feeling of decreased personal accomplishment. While studying health-care workers (nurses predominantly), Leiter and Maslach found that emotional exhaustion resulted from emotional overload caused by demanding service recipients and other situational specifics (e.g., job overload) of the work. To cope with such stress, service professionals withdrew from work through depersonalization. The result of this withdrawal reduced their capacity to deal with all of their work demands, thus resulting in a sense of decreased accomplishment.

As the linear, one-dimensional burnout model evolved into a more multidimensional process, an amended version was published that described emotional exhaustion occurring first and leading to depersonalization with feelings of decreased personal accomplishment developing separately (Cordes, Dougharty, & Blum, 1997; Lee & Ashforth, 1990; Lee & Ashforth, 1993a). Using structural equation modeling, cross-sectional design studies involving social workers (Lee & Ashforth, 1990, 1993b) and human resource workers (Cordes et al., 1997) found evidence to substantiate the model created by Leiter and Maslach (1988) that theorized that emotional exhaustion plays the central role in burnout ( $R^2 = 0.78$ ), which was determined by a goodness-of-

fit index ( $CFI = 0.88$ ) close to the criterion value of .90. Emotional exhaustion was directly correlated to job and life satisfaction (measured as time spent with clients and subordinates) and role stress (measured by role conflict and role ambiguity scales). Depersonalization and personal accomplishment were found to be indirectly associated with job social supports (measured by the extent of expressive and instrumental support from an employee's immediate supervisor and organization; Lee & Ashforth, 1993a).

Maslach and Leiter (1997) used case studies of nurses and support staff in two units of a Canadian hospital to propose a model linking job demands and social supports to the work environment. The authors identified six potential sources of burnout: (a) work overload, (b) lack of control, (c) lack of reward, (d) lack of community, (e) lack of fairness, and (f) value conflict. Maslach and Leiter hypothesized that a mismatch or degree of mismatch between the person and the six environmental sources leads to the likelihood of burnout. A mismatch occurs when the working relationship within the environment changes and is unacceptable to the worker. It may involve the nurse perceiving that the new patient admission load is more than he or she can manage (work overload) or that the supervisor will not change the nurse's assignment upon request (lack of control or fairness). Burnout results when chronic mismatches occur between the person and all or some of these six environmental sources of burnout (Maslach et al., 2001).

### **Key Sources of Burnout in the Work Environment**

Maslach et al. (2001) hypothesized both that burnout serves as a mediator and that the mismatches between the nurse and the environmental sources lead to burnout, which in turn leads to various outcomes. Descriptions and examples of the six sources of burnout of the work environment or organizational life (workload, control, reward, community, fairness, and values) are presented below. Emphasis is placed on looking at the person in context in terms of fit or

mismatch with the key sources of worklife. Mismatch toleration, or how much each individual person may tolerate, is unclear. Maslach (2003) suggested that toleration may depend on both the particular area of mismatch and the pattern of the other five areas. For example, higher degrees of toleration may result when a person can tolerate a mismatch in workload if there is praise from colleagues indicating value in work. The mismatch model provides a framework for the interactions that disrupt or enhance the relationships people develop with their work.

**Workload.** A mismatch in workload, or work overload, occurs when too many demands exhaust a worker's energy to the point that he or she cannot recover or adapt in the usual way or time frame (Maslach, 2003). A workload mismatch may occur if the individual lacks necessary skills for the work or when the quantity of work requested is perceived as unreasonable. Examples of this could be the novice nurse not having the skills to assess the patients in her care assignment or an individual nurse having a greater number of patients than seems reasonable.

**Control.** Control is related to an individual's perception of reduced personal accomplishment caused by a mismatch between the worker's lack of control or authority and the environmental resources needed to complete the work (Maslach, 2003). Distress is noted when workers feel responsible for results to which they are deeply committed but for which they lack the resources. Resources could be time, number of tasks or patients to care for, or staff support to complete the tasks. Individuals feel overwhelmed by the demands or tasks to complete without the authority to obtain more resources or help. This concept is related to work overload as well.

**Reward.** Another source of burnout in the workforce environment is the mismatch of rewards (Maslach, 2003). Nurses may exhibit feelings of reduced personal accomplishment based on their perceptions that appropriate rewards were not provided for the work they

completed. This may include financial or social rewards, such as salary considered not commensurate with a nurse's perceived personal achievement or recognition not perceived as sufficient. This lack of recognition devalues the work and worker.

**Community.** Chronic and unresolved conflict with other workers on the job results in negative feelings of frustration and hostility described as a lack of social support (Maslach, 2003). Such lack of support may result in isolation of the worker and loss of group cohesion of shared values in times of high workload or crisis conditions. Conflict results when there is a loss of the sense of positive connections with coworkers who share praise, comfort, and happiness with people they respect and from whom they seek approval.

**Fairness.** Another key source of burnout in the work environment is the feeling of unfairness in the workplace that can be emotionally exhausting and can lead to cynicism about the workplace (Maslach, 2003). Unfairness can occur with perceived inequities of workload or pay or when the worker's voice is perceived as unwanted in resolving disputes. Fairness confirms people's self-worth and assists in building trust and respect among colleagues.

**Values.** A conflict of values can occur when people feel that a job requires them to do things they believe are unethical or not in accordance with their own values. A conflict between an individual worker's values and the values of the organization or work situation may result in cynicism (Maslach, 2003). This is demonstrated when a nurse must work within a patient assignment that will not allow the achievement of the safety goals and values that the organization professes, but the nurse also knows that staff resources are limited by cost containment objectives stated by the organizational leadership.

## **Nurse Work Environments**

The IOM (2000, 2004) raised concerns about the connection between the working environments of nurses and patient safety following a decade of restructuring and downsizing in hospitals across the United States and Canada, along with poignant outcries by nurses over the deterioration of their working conditions (Weinberg, 2003). As a response to this concern, research on the impact of hospital-workplace environments on patient care was initiated.

Although the hospital care systems in the United States and Canada are not politically and financially identical, nurses caring for patients in most hospitals face similar issues. The foundation for this assumption is based on descriptions in the literature of hospitals in both the United States and Canada that have similar shifts and scheduled work, unit-specific patient populations, and patient assignments and tasks (Laschinger, Wong, & Greco, 2006). Woods (2010) aggregated data from multiple countries to conclude that health-care worker satisfaction causes improved quality and service through the empowerment of the workers. Reviewing Canadian studies is useful because both the U.S. and Canadian health-care systems provide care using a team-based care model, as well as embrace the Provider, Patient, Organization (PPO) principle.

Woods (2010) described the providers of direct care to patients as team members who were responsible for results of care. In addition, the value perceived by the patients and by each other as colleagues through the interdependent relationships was noted. Assuming that direct care nurses from both the United States and Canada work in teams with similar accountabilities for care and community relationships, Canadian studies of nurses related to workplace environment and patient care outcomes will be reflective of the U.S. nurse practice in lieu of studies conducted in the United States.

A longitudinal design study tested an expanded model of the work empowerment theory created by Kanter (1979) in a random sample of 192 Canadian acute-care staff nurses (Laschinger et al., 2003). Kanter described work environments that provide access to information, support, resources, and opportunities to learn and develop as empowering and influencing employee work attitudes and organizational effectiveness. Laschinger et al. (2003) hypothesized that structural and psychological empowerment provided at the beginning of the study would predict burnout 3 years later. Structural empowerment was measured by the Conditions for Work Effectiveness Questionnaire-II (CWEQ-II), psychological empowerment was measured by the Spreitzer Psychological Empowerment Scale, and burnout was measured by the MBI. All scales had internal consistency with reliabilities reported as .77 to .91. Structural equation modeling demonstrated a good fit of the data to the hypothesized model ( $\chi^2 = 198.68$ ,  $df = 85$ ,  $IFI = .90$ ,  $CFI = .90$ ,  $RMSEA = .08$ ). Perceptions of structural empowerment had a positive direct effect (.435) on psychological empowerment and a negative indirect effect (-.105) on burnout, measured at the beginning of the study. Psychological empowerment had a negative direct effect (-.280) on perceived emotional exhaustion, measured 3 years later, suggesting environments of empowerment resulted in increased feelings of psychological empowerment in the nurses who participated in the study (Laschinger et al., 2003).

Longitudinal studies carry the limitation that other events occurring during the time period of data comparison would account for the results; in this study, data was collected over the period of 3 years (Laschinger et al., 2003). In addition, the dropout factor of nurse participants (412 samples at the beginning of the study versus 192 samples 3 years later) is of concern for suspected differences in the samples not identified. The low explained variance

( $R^2 = .107$ ) suggested that other unmeasured factors may have affected the results, thus calling for further research on this topic.

In a random sample of 285 Canadian hospital nurses, a model was tested linking structural empowerment to the six areas of worklife proposed to be the precursors of work engagement or low burnout levels (Laschinger & Finegan, 2005). Laschinger and Finegan (2005) hypothesized that when employees' work environments provide the elements of structural empowerment (i.e., opportunity, information, support, resources, formal power, and informal power), employees are more likely to experience matches with the areas of worklife (i.e., control, value congruence, reward, community, fairness, and workload) and to endure less burnout. In this study, the CWEQ-II measured structural empowerment, the PES measured the areas of worklife, and the MBI measured burnout. All reliability alphas were reported as above .70 (Laschinger & Finegan, 2005).

Intercorrelations were analyzed to examine the relationships between the dimensions of empowerment and the six areas of worklife (Laschinger & Finegan, 2005). Access to resources was strongly related to work overload ( $r = -0.61$ ); support and formal power were moderately related to rewards ( $r = 0.55$  and  $0.49$ , respectively); information was moderately related to fairness ( $r = 0.43$ ); and informal power was moderately related to control ( $r = 0.35$ ) and positive working relationships ( $r = 0.37$ ). Emotional exhaustion was moderately related to work overload ( $r = 0.51$ ), reward ( $r = -0.46$ ), and community ( $r = -0.40$ ). Using structural equation modeling, the model including all the paths among the worklife variable interactions explained 41% of the relationships ( $\chi^2 = 48.3$ ,  $df = 21$ ,  $CFI = .96$ ,  $IFI = .93$ ). These results supported the argument that empowerment has an association with the six areas of worklife and burnout levels (Laschinger & Finegan, 2005). Thus, the presence of structural empowerment factors decreases burnout caused

by feeling unrewarded for work, unfairness, unreasonable workloads, lack of control over work, and lack of sense of community. A limitation of the study was that other factors also may contribute to the level of burnout, such as personal disposition (i.e., optimism or experience) or variability of the presence or absence of patterns of structural empowerment factors (Laschinger & Finegan, 2005).

In another study that randomly sampled 322 Canadian acute care nurses, Laschinger et al. (2006) tested the hypothesis that higher levels of empowerment would result in a greater fit in the six areas of worklife, leading to lower burnout. A cross-sectional design tested the hypothesis using the CWEQ-II to measure the structural empowerment factors, the Areas of Worklife Scale (AWS) to measure the six areas of worklife, and the MBI to measure burnout. All of these tools had been used in previous studies related to nursing, and reliability of each tool had been tested, all reporting alphas of greater than .70. Structural equation modeling was used to obtain a model with all six areas of worklife paths ( $\chi^2 = 32.7$ ,  $df = 13$ ,  $p = .05$ ,  $IFI = 0.97$ ,  $CFI = 0.97$ ,  $RMSEA = 0.07$ ), explaining 42% of the variance in burnout (Laschinger et al., 2006). These findings supported the model that structural empowerment factors play a key role in creating less burnout of employees. The findings suggested that organizational structures that empower nurses promote a greater sense of fit between nurses' expectations of worklife quality and lower burnout (Laschinger et al., 2006).

Using the mediation burnout model to test the areas of worklife in predicting outcomes, a study was conducted in Canada with a random sample of 667 hospital nurses to predict nurse turnover (Leiter & Maslach, 2009). A cross-sectional descriptive analysis tested the hypothesis that all three burnout dimensions predict turnover intentions of nurses through a relationship of mediation with worklife. The MBI measured the three factors of burnout (emotional exhaustion,



cynicism, and efficacy); the AWS assessed workload, reward, control, community, fairness, and values; and the Turnover Intentions Scale measured the intention to quit (Leiter & Maslach, 2009). All measures demonstrated internal reliability with alphas greater than .70. Structural equation modeling was used with results that supported the mediation model of burnout with all of the areas of worklife. The mediation model was a strong predictor of turnover intention ( $\chi^2 = 692.23$ ,  $p < 0.001$ ,  $CFI = 0.951$ ,  $RMSEA = 0.034$ ). Leiter and Maslach (2009) concluded that withdrawal from work, also referred to as depersonalization or cynicism, was the primary predictor of the intention to leave and was linked to the exhaustion from work overload, value conflicts, and unfairness in the nursing care model with inadequate reward systems. Results of the study indicated that burnout dimensions may have different effects for mediating different outcomes. Cynicism, or withdrawal from the work, was found to be the primary issue for turnover intentions (Leiter & Maslach, 2009).

More specific to the nursing practice environment, Leiter and Laschinger (2006) tested a model that defined structured relationships among the nursing worklife variables (leadership, RN and MD collaboration, policy involvement, nurse model of care, and staffing adequacy) within the nurse work environment that related to burnout and the six domains of worklife to predict burnout. This study sample of 8,597 Canadian hospital nurses (a subset of an earlier study) responded to the MBI, measuring burnout, and the Practice Environment Scale of the Nursing Work Index (PES-NWI), measuring the nursing work environmental variables. Both tools demonstrated reliability with alphas greater than .70. Including all the nursing worklife variables with the specified model pathways created by Lake (2002) demonstrated a good fit to the data through structural equation modeling to predict burnout ( $\chi^2 = 9,230.23$ ,  $df = 1.152$ ,  $IFI = .894$ ,  $CFI = .900$ ,  $RMSEA = .040$ ). The analysis supported a direct path from staffing to

emotional exhaustion and a direct path from the nursing model of care to personal accomplishment with leadership as a fundamental role throughout (Leiter & Laschinger, 2006).

Laschinger and Leiter (2006) tested the theoretical model of Leiter and Laschinger (2006) by proposing that factors within the professional nursing work environment that affect patient safety outcomes may be mediated by the burnout process. In this model, the interaction of worklife factors (leadership, staff participation, adequate staffing, support for the nursing model of care, and effective nurse and physician relationships) predict the extent of nurses' burnout with their work and indirectly predict an identified patient safety outcome. The random sample consisted of 8,597 Canadian acute care nurses, a subset from a larger study completed in 1998, who were surveyed through mailed questionnaires (Laschinger & Leiter, 2006). Using the MBI (Cronbach's  $\alpha = .78-.91$  for three subscales) to measure burnout, the PES-NWI (Cronbach's  $\alpha = .72-.84$  for five subscales) to measure the areas of worklife, and a frequency question of adverse events (Cronbach's  $\alpha = .75$ ) to measure patient safety outcomes, structural equation modeling ( $\chi^2 = 16,438$ ,  $df = 1344$ ,  $p < .001$ ,  $CFI = .908$ ,  $IFI = .908$ ,  $RMSEA = .037$ ) supported the role of the worklife factors (i.e., leadership, RN and MD collaboration, policy involvement, staffing adequacy, and nursing model of care) that indirectly affected nurse-reported adverse events. Burnout mediated the relationship. The authors concluded that patient safety outcomes were related to nursing practice environmental quality and that nursing leadership played the dominant role in changing the work environment to decrease nurse burnout (Laschinger & Leiter, 2006).

Data for this study were collected in 1998 and, although dated, are relevant to today's nursing experience in the reference to the environment and increased complexity (Laschinger & Leiter, 2006). Results also led the authors to call for more research on this topic in today's health-care setting (Laschinger & Leiter, 2006). The cross-sectional design of the study limited

the ability to see patterns of responses over time and how relationships between the environment and burnout levels impacted patient safety. However, the strong model fit supported the relationships between the environmental factors, burnout, and patient safety. While model testing did describe and note the interactive environmental factors with burnout levels resulting in adverse patient events, further studies are needed to validate findings in multiple facilities. Additional environmental factors also may be identified in qualitative study designs.

### **Work Environment Measurement**

The Practice Environment Scale – Nursing Work Index (PES-NWI) is a survey tool developed from the original Magnet<sup>®</sup> work that identified the organizational attributes that attract and retain nurses in the workplace. The original scale, NWI, was developed to assess nurses' perceptions of professional practice environments based on their descriptions of their work situations (Kramer & Hafner, 1989). The PES-NWI was developed to further refine and discern the contribution of the practice environment to nurse and patient outcomes (Lake, 2002). The PES-NWI measures the areas of the worklife model (Maslach & Leiter, 1997) with 31 items in five subscale domains (i.e., staffing, leadership, RN and MD collaboration, policy involvement, and nursing model of care). Respondents rate statements as *strongly disagree* to *strongly agree* on a 4-point scale. Dating from 2000, the tool has been used most frequently in U.S. studies to examine how the practice environment influences nurse and patient outcomes; studies also contributed to the validity and reliability of the measure. In terms of theoretical relevance, ease of use, and body of evidence, the PES-NWI tool demonstrates the nurse worklife environment factors; it is the only instrument with Magnet<sup>®</sup> hospital reference scores both from the original and more current American Nurses Credentialing Center (ANCC) Magnet<sup>®</sup> hospitals (Lake, 2007).

Leaders in nursing consider the ANCC Magnet® goals as a roadmap for safe patient care. Several decades ago, the American Academy of Nursing (AAN) conducted a descriptive study (McClure, 1983) to identify hospitals that attracted and retained nurses and the organizational features these hospitals shared. The study assumed that hospitals that attracted and retained nurses would provide higher quality of care for patients. The 39 hospitals identified in the study were referred to as Magnet® hospitals. In the 1990s, the Magnet Hospital Program® was established by the American Nurses Association (ANA) through the ANCC and was based on the 14 standards of nursing care identified in the original study.

Aiken et al. (2000) used a comparative, multisite, observational-design study to determine whether the ANCC's application-based process for Magnet® hospital designation found these hospitals to rank as favorably as the hospitals that were originally selected by the AAN for Magnet® designation. Hospitals were regionally selected to include 13 of the original Magnet® hospitals designated by the AAN (employing 981 staff nurses) and seven current ANCC-designated Magnet® hospitals (employing 1,064 staff nurses), allowing for a total sample of 2,045 nurses. The results were descriptive and bivariate with significance tests completed (chi-square and *t* test statistics) to ensure that the differences observed between the two groups were not a result of sampling fluctuations or chance. The Magnet®-accredited hospitals designated by the ANCC demonstrated lower nurse burnout rates (measured by the MBI) and higher-rated clinical practice environment factors (measured by NWI), such as nurse autonomy, nurses' control over their practice, quality of nurse and physician relationships, policy decision participation, strong nurse leadership, nurse satisfaction, and quality of care (Aiken et al., 2000). This was noted to be important for improved patient care in Magnet® facilities and a framework for nursing excellence and patient care outcomes.

## **Nurse and Patient Outcomes**

Following the negative ramifications of hospital restructuring in the 1990s, research on nurse burnout focused on the environmental stressors as the determinants of burnout resulting in staff turnover (Aiken & Sloane, 1997; Lake, 1998). Aiken et al. (2001) reviewed findings from a survey of 86,600 nurses working in 711 adult acute care hospitals in 1998 and 1999 across five countries (United States, Canada, England, Scotland, and Germany). The U.S. sample consisted of nurses in Pennsylvania hospitals who were invited to participate in a study consisting of written surveys mailed to their homes. Nurse burnout was measured by the MBI; job dissatisfaction was surveyed with questions that were not described in the published study. Patient outcome data were obtained from hospital and administrative databases across all countries and the state of Pennsylvania. Aiken et al. (2001) found that over 40% of nurses working in the United States were dissatisfied with their jobs and felt overwhelmed and exhausted as measured by the MBI. Nurses' intentions to leave their jobs were reported as greater than 20% in the United States and 30% in Europe. Of particular concern was the finding that nurses under 30 years of age in all countries reported the highest intention to leave their jobs within the next year (Aiken et al., 2001).

Aiken et al. (2002) followed with a study focused on a cross-sectional analysis of survey and hospital clinical data from 10,184 nurses in 168 adult acute care hospitals in Pennsylvania. An increased workload for nurses as identified in higher patient-to-nurse ratios was associated with a higher nurse burnout rate ( $OR = 1.23$ , 95% CI [1.13-1.34],  $p < .001$ ); higher risk-adjusted, 30-day mortality rates among surgical patients (death within 30 days of admission;  $OR = 1.07$ , 95% CI [1.03-1.12],  $p < .001$ ); and failure-to-rescue rates among surgical patients (death within 30 days of admission among patients with complications;  $OR = 1.07$ , 95% CI [1.02-1.11],  $p <$

.001). The odds ratios (*OR*) indicated that burnout increased by 23%, mortality by 7%, and failure to rescue by 7% with each one patient per nurse increase.

Nurse staffing adequacy has been associated with patient mortality and burnout (Aiken, et al., 2002; Tourangeau, Giovanetti, Tu, & Wood, 2002). Other factors may influence patient safety; appreciation of the relationships among the factors and burnout would inform direction for intervention or change modifications. Aiken et al. (2002) found the significance of adding to the workload of nurses increased mortality and failure to rescue rates. Identifying with more specificity the actual nurse practice activities that may have been omitted or compromised would assist in interventional changes for patient safety and perhaps lead to better sustainability and understanding for nurse practice (Aiken et al., 2002). What is unknown is the effect that burnout and the environmental factors' interacting relationships have on patient mortality.

Mortality rates were lower in Magnet<sup>®</sup> hospitals in two studies (Aiken, Sloane, Lake, Sochalski, & Weber, 1999; Aiken, Smith, & Lake, 1994), but another study found no difference in mortality rates (Hickey, Gauvreau, Connor, Sporing, & Jenkins, 2010). Pressure ulcer rates were lower in one Magnet<sup>®</sup> hospital study, but no difference was found in failure to rescue rates in Magnet<sup>®</sup> and non-Magnet<sup>®</sup> hospitals (Mills, 2008). A study using secondary data analysis of University HealthSystems Consortium databases from 2005 compared 19 Magnet<sup>®</sup> hospitals to 35 non-Magnet<sup>®</sup> hospitals and found slightly lower rates of pressure ulcers in the Magnet<sup>®</sup> hospitals. However, no difference was found in adverse event rates including catheter-line infection rates, postoperative sepsis, length of stay, failure to rescue rates, and mortality rates in congestive heart failure and myocardial infarction patients (Goode, Blegen, Park, Vaughn, & Spetz, 2011). The literature has not found consistent results of Magnet<sup>®</sup> hospital influence.

More research to identify the practice implications of the environment and nurses' responses to them would add to quality care improvement. Patient care involves many separate tasks by nurses to assure safety, and one failure or error in any task may lead to a poor patient outcome.

Aiken et al. (2012) used a cross-sectional international survey study to determine whether adequate staffing and other environmental factors (measured by the PES-NWI) as well as nurse burnout (measured by MBI) were associated with nurses' perceptions of patient safety (measured by one item of the AHRQ Patient Safety Culture Survey) and patient satisfaction (measured by the Hospital Consumer Assessment of Healthcare Providers and Systems instrument). In the United States in 2006-2007, survey data from 27,509 nurses in 617 hospitals and data from 120,000 patients in 430 of these hospitals were used. Regression analysis found 34% of nurses reported themselves to be burned out, and 6% gave a failing safety grade to patient care, with 16% reporting poor quality of care. Forty-six percent of nurses reported no confidence in discharge patient care planning, and 57% had no confidence that hospital management would address problems. Nurses with better hospital environments (as measured by PES-NWI scale) were half as likely to report poor care quality ( $OR = 0.54$ , 95% CI [0.51-0.58]) and to give failing grades on patient safety ( $OR = 0.55$ , 95% CI [0.50- 0.61]). Those hospitals with a higher environment rating on the PES-NWI scale influenced the effect of reducing nurse burnout ( $OR = 0.71$ , 95% CI [0.68-0.75]). Patients in better work environment hospitals were more likely to rate their hospital high in quality perceptions ( $OR = 1.18$ , 95% CI [1.13-1.23]) but less likely to rate their hospital as high when there was a higher percentage of nurse burnout ( $OR = 0.93$ , 95% CI [0.91- 0.96]). Patients in hospitals with higher levels of nurse burnout also reported less favorable nurse communication ( $OR = 0.98$ , 95% CI [0.94- 0.99]). Findings of patient and nurse

ratings of hospitals were comparable between those in European countries (Belgium, England, Finland, Germany, Greece, Ireland, Netherlands, Norway, Poland, Spain, Sweden, and Switzerland) and those in the U.S. (Aiken et al., 2012).

Appreciating that a positive work environment influences the levels of nurse burnout or engagement and patients' perceptions of quality, more understanding and awareness of this influence on direct patient care activities in the complex health-care environment would assist health-care providers to develop interventional plans for improvement and support of focused environmental positive changes. Aiken et al. (2012) demonstrated that environmental factors influence nurse and patient perceptions of safety and quality, yet the effect on actual nurse practice activities and what mechanisms are interacting to influence change in practice is unknown. The environment is associated with nurse practice, but more needs to be learned about the relationships of one factor to another and what consequences are seen between the nurse and patient.

Using 2006 survey data of 7,076 staff nurses in 161 hospitals in Pennsylvania, Cimiotti et al. (2012) associated nurse burnout with surgical site and catheter-associated urinary tract infections as reported in the 2006 Pennsylvania Health Care Cost Containment Council report on hospital infections as defined by the Centers for Disease Control and Prevention. Through linear regression analysis examining an association between nurse burnout as measured by the MBI and infection rates, nurse burnout was highly associated with both urinary tract infections ( $\beta = 0.85, p < .02$ ) and surgical site infections ( $\beta = 1.58, p < .01$ ). Every 10% increase in a hospital's proportion of high nurse burnout ( $\geq 27$  score on the MBI) was associated with an increase of nearly one urinary tract infection and two surgical site infections per 1,000 patients. Cimiotti et al. (2012) concluded that the higher rate of infections occurring in hospitals in which nurses



cared for more patients seemed to be related in part to high nurse burnout associated with increased patient caseloads. This finding is in accordance with previous findings that burnout affects patient safety; however, more information is needed to determine nurse practice patterns related to burnout that would be necessary in designing interventional studies for improvement.

The relationship of nurse burnout to the perception of patient safety was studied in a small convenience sample ( $n = 148$ ) of nurses from one Midwestern U.S. hospital (Halbesleben et al., 2008). Nurses were given the MBI (Cronbach's  $\alpha = .88$ ) and the AHRQ Patient Safety Culture Survey. The AHRQ Patient Safety Culture Survey measures two outcomes that assess patient safety perceptions (safety grade and safety perceptions; Cronbach's  $\alpha = .81$ ) and two that assess reporting behaviors (event reporting and near-miss reporting; Cronbach's  $\alpha = .87$ ). Using regression analysis and controlling for demographics, higher levels of burnout among the nurses were associated with a perception of a less safe patient environment ( $\beta = -0.84, p < .001, R^2 = .36$ ) and a lower frequency of near-miss (preventive) event reporting ( $\beta = -0.14, p < .05, R^2 = .18$ ). A possible explanation offered was that burnout may contribute to a decrease in vigilance by nurses who have less energy to take preventive actions (Halbesleben et al., 2008); this explanation would concur with Maslach's definitions of burnout.

The cross-sectional nature of the findings of this study by Halbesleben et al. (2008) limited the assessment of the dynamics of the environmental complexity and responses to such in identifying patterns of change over time. Although the study controlled for demographic information of the nurses, no other environmental factors such as the PES-NWI variables were included; this deletion contributed to the consideration of an underspecified model of intervening burnout antecedents or influences associated with the perception of safety and reporting events (Halbesleben et al., 2008). While burnout contributed to 36% of the nurses' perception of safety

variance, more information is needed to appreciate how and what nurse practice activities are affected. The sample was limited to one hospital (Halbesleben et al., 2008); a larger sample size and sampling from different hospitals with more information regarding the specialty practice of nurses would enhance the knowledge base of burnout effects for generalizability and the identification of any patterns in the work environments with more specificity of practice. Observing directly or asking nurses what activities they actually complete or not would add more specificity and clarity with a more robust understanding of nursing practice and how it may be affected by burnout. Measuring patient safety with more specificity through direct reporting or observation would add knowledge for interventional considerations. Direct observation, however, can add bias influences because the observer is interacting in the environment and may contribute direct or indirect feedback to the participants.

### **Missed Patient Care**

System experts argue that with the ever-changing and rapidly paced environment of health-care systems, health-care workers will always deal with competing goals and stress (Cooks, Render, & Woods, 2000). Studying a small sample of experienced staff nurses, Ebright, Patterson, Chalko, and Render (2003) found that nurses use *stacking* actions to manage activities in situations of time pressure or lack of resources and information. Nurses also used stacking activities to monitor patients and deliver care. Stacking is the invisible, decision-making work of nurses to determine what care is possible for patients, along with when and how to deliver such care with *trade-offs* (Ebright et al., 2003; Ebright, 2010). Trade-offs are those decisions that nurses make among different but interacting or conflicting goals; nurses sometimes must choose between two tasks that cannot be completed in the same time period. Nurses' clinical decision making is influenced by their ability to be mindful or pay attention to and make sense of

changing information within their patient assignments and time-limited shifts (Ebright, 2010). Logically, nurses experience high stress when time is spent making trade-off decisions among equally important activities that affect safety and quality of patient care; this situation creates job dissatisfaction and burnout.

Knowing and understanding the actual nursing activities or stacking actions that lead to negative patient outcomes, such as patient falls and skin breakdown, would be helpful to focus on solutions to improve patient care and safety and to assist nurses in planning for care. Kalisch (2006) found that basic nursing care, such as turning patients as needed, teaching as needed, and hygiene care, is omitted by nurses based on reduced resources and inadequate nurse coping mechanisms (i.e., the ability to prioritize tasks and duties without a sense of emotional exhaustion and helplessness in the frontline work environment). The AHRQ and patient safety literature have defined two major types of errors: commission and omission. An example of commission would be marking the incorrect side and site of a patient for a surgical procedure; an example of omission would be not turning a patient when planned. Missed care is an error of omission that is much more difficult to identify (Kalisch & Williams, 2009).

The concept of missed nursing care was first identified by Kalisch (2006) in a qualitative study of 25 focus groups (consisting of 107 RNs, 15 licensed practical nurses, and 51 nursing assistants) in two Midwestern hospitals. Interviews were conducted using a semistructured design and taped with full transcription. A research associate initially analyzed the interviews; this was followed by Kalisch independently using qualitative software and applying a grounded theory approach by which empirical data were thematically categorized by induction. To have been included, each theme of missed care must have been present in both hospitals and in all focus groups. The focus groups were asked whether there were aspects of care that was missed

on a regular basis. The staff reported nine elements of regularly missed care: ambulation, turning, delayed or missed feedings, patient teaching, discharge planning, emotional support, hygiene, intake and output documentation, and surveillance (Kalisch, 2006). Seven themes were delineated regarding the reasons for missed care: too few staff, poor use of existing resources, time required for the nursing intervention, poor teamwork, ineffective delegation, habit, and denial (Kalisch, 2006).

Only one other study (Sochalski, 2004) referenced similar findings with unfinished nursing tasks (e.g., patient teaching and counseling, skin and oral care, documenting patient problems and interventions, and discharge planning). These tasks were related to staffing levels and the quality of nursing care. Sochalski (2004) analyzed secondary data from a 1999 mailed survey of 8,670 acute care staff nurses in Pennsylvania. The study objective was to assess whether nursing workload is associated with nurses' reports on the quality of nursing care in hospitals, and whether workload is related to indicators of the process of nursing care that also are associated with quality care. Quality of care was assessed by one item in the survey that asked on a 4-point category scale how well nurses would rate the care given to patients on their last shift. Patient workload was assessed by asking nurses to indicate the number of patients they cared for directly on their last shift. Nurses also were asked to indicate from a list of seven tasks those that were not completed during their last shift because of lack of time (Sochalski, 2004). Multivariate regression models were used to assess the combined effects of all study measures on quality of care. With each patient addition to nurse workload, associated decline was demonstrated ( $R^2 = .10$ ) in point scores of quality ( $b = -.07$ ). Adding unfinished care to the model produced the largest share of the explained variance ( $R^2 = .43$ ). Sochalski concluded that although workload could be one factor associated with greater frequency of patient safety

problems, other features in the work environment also played important roles and could be interfering with the nurses' effort to reduce their occurrence. This appears to be a reasonable conclusion in the context of the complexity of today's work environment.

Kalisch (2006) found that guilt and fear were associated with the reports of missed nursing care and were the reasons for nurses not reporting or discussing missed care freely. This was validated by Attree (2007), who interviewed 142 acute care nurses in England from three acute care hospitals. The study aimed to explore nurses' perceptions of standards of nursing practice, discover whether nurses have concerns about practice standards, and deal with any concerns. Grounded theory was used to facilitate exploration using semistructured questions about the nurses' perceptions of the standards of practice and how they handled concerns (Attree, 2007). Nurses described experiencing practice dilemmas representing conflict between a professional duty to raise concerns and predictions of negative consequences along with a belief that nothing would be done about concerns. The belief that powerlessness, fear, and guilt contribute to the lack of reporting missed care was evidenced in the interviews with nurses (Attree, 2007). This belief has been demonstrated in another study by displays of emotion (i.e., anger, sadness, frustration, and worry; Kalisch, 2006). This belief and reaction perhaps also could be a description of disengagement and emotional exhaustion in that withdrawing from work (i.e., missed care) results when a nurse experiences frustration (i.e., conflict and dilemmas) and fear of negative consequences. Clearly, the sense of personal accomplishment may be affected as well with missed care events reported by nurses. For example, an acute care staff nurse working a shift at a hospital may encounter a patient assignment load that appears reasonable in the beginning, but during the shift one of the patient's conditions deteriorates and requires additional time. To provide care to this patient and the other patients, the nurse's

assessment is that she needs more assistance; however, in asking for more help, she perceives that she will be judged harshly and may receive a negative performance evaluation. During this time, feeling frustrated and fearful, she begins to miss care tasks to finish the shift on time and not ask for help. This may produce feelings of inadequacy and result in poor patient care outcomes.

A concept analysis on missed care identified the following antecedents as outside of a nurse's control, requiring the nurse to continually make decisions about what care can be provided to patients: (a) demand for patient care, (b) resource allocation-labor, (c) resource allocation-materials, and (d) relationships and communication (Kalisch, Landstrom, & Hinshaw, 2009). The choice to miss nursing care (i.e., delay, not complete, or omit) is impacted by internal factors influencing the nurse, namely team norms, decision-making processes, internal values and beliefs, and habits. Missed care may lead to patient outcomes that are harmful. Similar to the stacking actions described by Ebright (2003), missed care was associated with feelings of pressure from workload demands and conflicts of confrontation with coworkers resulting in not completing tasks or in denial of missed care. Stacking, or moving on to other activities when not able to complete a task, was described as avoiding both conflict with coworkers and situational demands (i.e., workload or obstacles).

The antecedents of missed care influence the nurse's internal processes that logically may be associated with burnout dimensions. Tetlock (1985) noted that decisions are made by individuals in the context of a social system in which they belong and seek approval. Making decisions according to the social system (team) norms avoids censure and adds to each individual's approval and respect in the group, thus enhancing the individual's self-image. Time pressures or a heavy workload placed on a nurse set up a dilemma for the nurse because choices

need to be made with competing demands. The internal factor of values and beliefs sets up further dilemmas in that the nurse making choices of care knows the value of planned care but must omit care based on conflicting demands. Feelings of regret and guilt are realized, and Larrick (1993) noted that regret makes people question their ability to make good decisions, thus compromising self-image. Having to make the decisions without the support of others coupled with the perception of questionable decision-making would lead to a sense of poor personal accomplishment. Habits of missed care are formed after ongoing actions are not noticed and no known detrimental patient side effect is realized (Kalisch, Landstrom, & Williams, 2009), which results in disengagement and depersonalization.

### **Patient Safety Indicators**

Nurse-sensitive patient care outcome indicators are quality indicators used in the development of evidenced-based health-care report cards and assist with directing change (Gallagher & Rowell, 2003). With a national mandate to do more with less and achieve better outcomes, accountability of nursing care outcomes was demanded by the public (ANA, 1995). The NDNQI<sup>®</sup> was established by the ANA in 1998 to monitor outcome indicators and nurse staffing impacts on these indicators in acute care hospitals (NDNQI<sup>®</sup>, n.d.). Data were collected from participating hospitals on nursing care hours per patient day, nurse skill mix, RN education, RN certification, patient injury fall rate, nosocomial pressure ulcer rate, patient assault rate, pediatric pain management, pediatric peripheral intravenous infiltration, and injury assault on psychiatric units. Hospitals transmit data to the NDNQI<sup>®</sup> quarterly. Data undergo quality assurance reviews and processing, and then that information is summarized and published in a quarterly report to participating hospitals.

## **Pressure Ulcers**

A pressure ulcer is any lesion caused by unrelieved pressure, resulting in damage of underlying tissue usually over a bony prominence (National Pressure Ulcer Advisory Panel, n.d.). The prevalence rate of pressure ulcers acquired during an acute care hospitalization is one of the nurse sensitive indicators identified through research by the ANA to explore the relationships between RN staffing, length of stay, and patient outcomes (Gallagher & Rowell, 2003).

The ANA (1995) focused on the development of patient safety or nursing quality initiatives based on the lack of knowledge regarding nurse-sensitive quality indicators and the public perception that adverse events reflected delivery of poor quality nursing care. The primary purpose of the work was to identify relevant nursing-sensitive indicators with a high degree of specificity to nursing. The theoretical framework of the indicators was based on the theory of Donabedian (1982) that focused on the structure and process of care and patient-centered outcomes. A panel of nursing experts, using the Delphi approach, identified 10 nursing indicators, and skin integrity or hospital-acquired pressure ulcer prevalence rate was identified as one of the 10 outcome indicators (Gallagher & Rowell, 2003).

Reliability of the NDNQI<sup>®</sup> outcome indicators was established using Web-based rater-to-standard reliability testing to establish reliability among many hospitals located in different places. Rater-to-standard reliability was defined as the agreement between a rater (hospital-based) and expert panel opinion. Guidelines established by the National Pressure Ulcer Advisory Panel (NPUAP) and the AHRQ were used as the criterion reference for the pressure ulcer classification by the expert panel and raters (National Pressure Ulcer Advisory Panel, n.d.; Panel for the Prediction and Prevention of Pressure Ulcers in Adults, 1992). In a random sample



of 48 NDNQI<sup>®</sup> hospitals with reported pressure ulcer prevalence data, the reported Cohen  $\kappa$  (percentage agreement between two or more raters that occurs beyond chance) was 0.56 ( $SD = 0.22$ ) for wound identification and 0.65 ( $SD = 0.21$ ) for pressure ulcer staging demonstrating moderate to substantial reliability (Hart, Bergquist, Gajewski, & Dunton, 2006).

No studies have been found relating nurse burnout or the nurse work environment directly to pressure ulcer outcomes. As reviewed previously, patient outcomes studied related to nurse burnout and the nurse practice environment included patient mortality and failure to rescue rates (Aiken et al., 2002) and patient infection rates (Cimiotti et al., 2012).

### **Patient Safety Issues**

Burnout is a widespread issue among health-care workers (Hansen et al., 2009). Because the health-care work environment is uncertain, complex, and dynamic, nurses may perceive or experience a sense of frustration and stress in attempting to meet patient care needs. Quinn (2002) described burnout as nurses “stymied in their capacity to care... inhibiting flow of caring, love, and healing energy” (p. 9). Many in health care believe that hospitals are far from being safe and that the path to achieve this goal of patient safety will be long because of the complexity and uniqueness of hospitals. The variations in hospital procedures and the dynamic role of human beings as both caregivers and patients add layers of complexity not yet fully understood. As the demands on each nurse continue to rise, work may become less meaningful, with consequences appearing in the delivery of care to patients.

Bae (2011) conducted a systematic literature review to evaluate associations between nurse working conditions and patient outcomes and found inconclusive evidence of positive relationships. Dating from 2000 to 2009 and written in English, 11 studies were evaluated that met the inclusion criteria of primary and quantitative designs using nurse populations, with direct

measures of outcomes as the dependent variable and working conditions as the independent variable. Nine studies were conducted in the United States, one in Canada, and one in Japan. Of the 69 relationships identified in the analysis, 40 were not statistically significant, 21 demonstrated a positive relationship, and eight showed a negative relationship between nurse working conditions and patient outcomes. A linear framework was used in many of the studies with a suggestion that a structural contingency framework be used for future studies to understand the moderator and mediator effects of the working conditions (Bae, 2011).

Poghosyan, Clarke, Finlayson, and Aiken (2010) completed a secondary analysis of cross-sectional data from a previous national study in Canada of 5,980 nurses, along with patient and hospital data in acute care hospitals. In a logistic regression analysis, burnout (measured by the MBI) and nurse work environment (measured by the PES-NWI) were found to significantly impact patient mortality ( $OR = 1.08$ , 95% CI [1.07-1.09],  $p < .01$ ). The study data was collected over a period of several years, raising concerns about the generalizability of the study, but the pattern consistency of an association between quality of care and burnout may speak to the complexity of the environment.

Little has been done to probe the dynamic relationship between nurse burnout and quality of patient care even though Maslach and Jackson (1985) have consistently suggested that burnout affects job performance. Measuring nurses' perceptions of quality of care related to burnout may add information about what nurses are thinking and contribute to feedback loops for better appreciation of the setting, but little is known about the actual effects on patient care or the provisional steps of care. Research is wanting that has linked nurse burnout to direct patient care errors or gaps in care in the recent 5 years (2007-2012).

Because burnout is characterized by feelings of withdrawal from patients, ineffectiveness, and energy and emotional depletion, it seems plausible that burnout reduces effective and efficient care of patients (Poghosyan et al., 2010). Evidence found in the literature demonstrates that the health-care work environment and patient safety data are being studied for the purpose of reducing errors and improving patient safety. The environmental factors that create the context of nurse worklife have influenced patient care outcomes, but little is known about the relationships of the environmental factors and what influence they have on nurses' practice directly and on patient care. Only four studies have been published related to nurse burnout and the effects it may have on patient care in the United States in the last 10 years (Aiken et al., 2002; Aiken et al., 2012; Cimiotti et al., 2012; Halbesleben et al., 2008). Linear model analysis has been used to analyze and predict nurses' perceptions of safety, adverse events reporting, and patient perceptions of safety or quality related to burnout. Although the findings have built a foundation that associations among health-care environmental factors and burnout influence patient care, the concern remains that patterns of emerging practice and outcomes have not been identified.

Given that nurses with burnout exhibit decreased personal accomplishment, it has been shown through a meta-analysis that the effect of burnout on nurse performance would change nurse practice negatively (Thoresen, Kaplan, Barsky, Warren, & deChermont, 2003). Related to the term of personal accomplishment, Isen (2001) found that positive affect (positive personal accomplishment) promotes flexible problem solving and clarity of thinking in an organized fashion. Thus, negative affect might do the opposite or minimally decrease flexibility in thinking and problem solving. Improving patient safety is dependent on nurses' care and responses to

variation in patient needs and environmental complexities (IOM, 2000). Burnout among nurses could potentially contribute negatively to patient safety through subsequent actions.

Nurses influence the safety and care of patients directly and encounter stress as a reflection of the current state of health care, which results in high levels of job frustration and dissatisfaction for many nurses. A random sample of 3,500 RNs from across the United States (Ulrich, Buerhaus, Donelan, Norman, & Dittus, 2005) completed surveys as a follow-up to a 2002 study conducted by Nurse Week Publishing and the American Organization of Nurse Executives regarding the views of RNs on the nursing shortage, workplace environment, and their future career intentions. Descriptive statistics and *t* tests were used to detect differences in proportions in a 53% response rate to the survey in the studies. No change was found between the two studies regarding the level of opportunity of nurses to influence decisions in the workplace and time spent to build relationships with their patients. There was an improvement noted with the working relationship between nurses (71% as compared to 54% in the first survey) and slight improvement noted with the working relationship of nurses with physicians. Respect and recognition of nurses were not improved and were found to be of concern in terms of the impact this lack of respect and recognition may have on working relationships. Burnout was reported by 53% of the nurses related to the stress level with their job, and 96% thought the stress would get worse and add to the nursing shortage (Ulrich et al., 2005).

Over 90% of potential errors are related to the inability of a nurse to access the necessary information or materials resulting in stress for the nurse (Tucker & Edmondson, 2003). Tucker and Edmondson (2003) observed nurses in the workforce for 239 hours and interviewed 26 nurses at nine hospitals; these researchers identified two types of process failures: problem solving and errors. Errors are the execution of a task that is either unnecessary or incorrectly

carried out and that could have been avoided with appropriate distribution of pre-existing information. Problem solving is doing what is necessary to complete a task without addressing the greater organizational malfunction, and nurses frequently use problem solving because of time pressures, lack of resources, and organizational power limitations (Tucker & Edmondson, 2003).

An example of problem solving by nurses, given the time pressures and resource and power limitations in today's health-care environment, was uncovered in a study reviewing 247 nurses in two Midwestern U.S. hospitals that found the use of *work-arounds*, or potentially unsafe work practices, for medication administration associated with burnout (Halbesleben, Rathert, & Williams, 2013). The purpose of the study was to examine the relationships between emotional exhaustion and work-arounds in the context of nursing administration of medications. Emotional exhaustion was measured by the MBI, work-arounds were assessed using a survey asking four questions about altering work processes for medication administration, and satisfaction with medication administration was measured using the Medication Administration System-Nurses Assessment of Satisfaction scale. Using hierarchical regression analysis, support was found relating emotional exhaustion to work-arounds ( $\beta = .38, p < .01$ ), and satisfaction with medication administration moderated the relationship between exhaustion and work-arounds ( $\beta = -.30, p < .01$ ). The study concluded that nurses who are satisfied with work processes can reduce unsafe practices (Halbesleben et al., 2013). Nurses are expected by patients and families to act as agents of caring and to allow no harm (Ramsey, 2005); however, working under conflicts of safety and efficiency increases nurses' perceptions of workplace demand and distress (Ingersoll, Fisher, Ross, Soja, & Kidd, 2001).

Ramanujam et al. (2008) surveyed 430 nurses at two community hospitals in the United States to determine if nurses' perceptions of job demands were related to their perceptions of patient safety. Emotional exhaustion, depersonalization, work demands, work volume, and personal control were measured by a survey, but the tool was not described in the study. Structural equation modeling was used to analyze the data. Nurses who perceived a large amount of work and little personal control over working conditions tended to perceive higher work demands (Ramanujan et al., 2008). The level of personal control over practice directly affects nurses' perceptions of the ability to assure patient well-being, and nurses' perceptions of patient safety decrease as the job demands increase ( $\chi^2 = 1057.918$ ,  $df = 481$ ,  $p < 0.05$ ,  $CFI = 0.889$ ,  $RMSEA = 0.053$ ; Ramanujam et al., 2008).

While there are some nurses who practice with malice and intent to harm, they are few (Wolf, 2012). In general, nurses are the most trusted and respected health-care professionals and top of the lists of most trusted professions in public opinion polls (Saad, 2008). Most nurses are dedicated to the welfare of patients purposefully through caring (Rudolfsson, Von Post, & Eriksson, 2007) but encounter much stress in the work environment.

### **Summary**

Research has focused on associations of nurse practice environments, nurse job satisfaction, and nurse burnout using hospital-wide measures of nurse outcomes such as turnover rates of nurses, job satisfaction, and patient outcomes of mortality and failure to rescue rates (Aiken et al., 2008; Estabrooks et al., 2005; Friese et al., 2008; Tourangeau et al., 2007). With the assumption that Magnet<sup>®</sup> hospitals have lower risks of nurse burnout and better patient care, more research is needed given the mixed results between Magnet<sup>®</sup> and non-Magnet<sup>®</sup> hospitals when comparing environmental influences on patient care outcomes.

More information is needed to better understand what influences the nurse at the bedside to avoid or address burnout and improve patient care quality and safety. Little is known about the impact of nurse burnout on the changes in direct patient care that contribute to patient outcomes. Desired outcomes include improvement in patient safety as measured by defined criteria and improved emotional well-being for the nurse in the health-care system.

A linear framework was used in many of the studies with a suggestion that a structural contingency framework be used for future studies to understand the moderator and mediator effects of the working conditions (Bae, 2011). The key element of structural contingency theory is that organizational performance results from a fit between characteristics of a structural organization and environmental aspects (i.e., contingency factors; Donaldson, 2001). There is no one best way for model structure. Modifying the burnout mediation model proposed by Laschinger and Leiter (2006) to better fit the current health-care environment regarding the relationship between nurse burnout and nursing care practices by examining the influences of the environment on burnout and missed care is the first step in identifying influences related to direct patient care (see Figure 1, p. 4). Next steps would include using more sophisticated analyses that examine moderator and mediator effects along with the potential feedback loops; this is not part of this study.

## **Chapter III**

### **METHODS**

Chapter Three describes the methodology used to examine the relationships of environmental worklife indicators, nurse burnout, and missed care with patient outcomes in acute care hospital settings using a modified model of nurse burnout (see Figure 1, p. 4). This chapter includes an overview of the research design, sample, sample setting, operational definitions of the measures, data collection procedures, data analysis plan, and limitation considerations for the primary aim.

#### **Design**

A secondary analysis of NDNQI<sup>®</sup> data using a longitudinal design was used to meet the primary aim of the study: examining the relationships of the environmental worklife indicators, nurse burnout, and missed care with patient outcomes in medical or surgical inpatient hospital units. The study utilized a secondary analysis of data from the NDNQI<sup>®</sup> 2011 and 2012 RN Surveys and quarterly clinical data collection. The NDNQI<sup>®</sup> mission was reported to aid the RN in patient safety and quality improvement efforts by providing national comparative data to participating hospitals and by conducting research on the relationship of nursing care and patient outcomes (NDNQI<sup>®</sup>, n.d.).

The NDNQI<sup>®</sup>, established in 1998, was a program of the American Nurses Association (ANA) National Center for Nursing Quality (NCNQ) that was purchased in 2014 by Press Ganey Associates, Inc. It is the only national nursing quality measurement program that provides hospitals with unit-level performance comparison reports for state, national, and regional percentile distributions.



The nurse burnout mediation model (Laschinger & Leiter, 2006) was adapted for this study and was used as a guiding framework for the study design and analysis. In addition to burnout, environmental factors affect the processes of care (e.g., missed care), and these factors, in turn, affect the outcomes of care (i.e., hospital-acquired pressure ulcer prevalence rates), providing a comprehensive approach to evaluating quality (NDNQI<sup>®</sup>, n.d.).

### Sample and Setting

The sample for the primary aim was taken from data from NDNQI<sup>®</sup> member hospitals that participated in the 2011 and 2012 NDNQI<sup>®</sup> RN Surveys and quarterly clinical data collection. Data were analyzed at the unit level; sampling inclusion criteria of the NDNQI<sup>®</sup> database are listed for hospital, unit, and RN participation in Table 2.

Table 2

#### *Study Inclusion Criteria*

Inclusion Criteria	
Hospital	Member of NDNQI <sup>®</sup>  Participated in the 2011 and 2012 NDNQI <sup>®</sup> surveys  Selected the RN Survey using the PES-NWI scales
Unit	Unit types: adult medical, surgical, medical-surgical  ≥ 5 RN responses per unit and ≥ 50% response rate  Reported NDNQI <sup>®</sup> 2011 and 2012 pressure ulcer data
RN	Employee of hospital  Full-time, part-time, or per-diem  Spent ≥ 50% of time in direct patient care  Employed ≥ 3 months on unit or workgroup

The total number of participants in the 2011 and 2012 NDNQI<sup>®</sup> RN Surveys (Practice Environment Scale-Nurse Work Index [PES-NWI]) and the participants in the clinical data collection are listed in Table 3 by hospital, unit type, and RNs. Medical surgical units that participated in the 2011 and 2012 NDNQI<sup>®</sup> RN Surveys PES-NWI comprised approximately 85% of the hospitals in both years; 75% of these hospitals in 2011 and 79.1% in 2012 had response rates greater than 50%, and approximately 52% of those completed the PES-NWI both years.

Table 3

*Number of Participants in 2011 and 2012 NDNQI<sup>®</sup> RN Surveys with PES-NWI and Clinical Data Collection*

	All units			Medical/Surgical/Medical-Surgical units		
	Hospitals	Units	RNs	Hospitals	Units	RNs
	2011/ 2012	2011/ 2012	2011/ 2012	2011/ 2012	2011/ 2012	2011/ 2012
Total participants	677/ 927	12,915/ 18,874	326,750/ 327,396	572/ 794	2,366/ 3,421	71,142/ 70,350
≥ 5 RN/Unit ≥ 50% response	658/ 899	9,690/ 13,760	286,316/ 284,242	506/ 711	1,898/ 2,710	64,321/ 62,557
PES survey	421/ 605	7,934/ 12,260	206,085/ 220,422	353/ 513	1,423/ 2,165	45,090/ 45,863
PU data	550/ 741	2,251/ 3,143	67,177/ 66,529	300/ 430	1,118/ 1,622	39,292/ 38,977

*Note.* PU = pressure ulcer. PES survey = Practice Environment Scale survey.

## **Hospitals**

Approximately 670 hospitals and 900 hospitals participated in the 2011 and 2012 NDNQI<sup>®</sup> RN Surveys, respectively. NDNQI<sup>®</sup> survey data assist hospitals to identify needs of the RN staff, improve the work environment, enhance retention and recruitment, and assist in quality improvement efforts. In 2011, approximately 62% of the NDNQI<sup>®</sup> hospitals taking the annual RN Survey participated in the PES-NWI data collection. In 2012, 605 hospitals participating in the RN Survey used the PES-NWI (see Table 3, p. 49), representing approximately 65% of the member NDNQI<sup>®</sup> hospitals. The study sample of hospitals was selected using the criteria listed in Table 2 (p. 48).

## **Units**

The unit sample included only medical, surgical, and medical-surgical units from the eligible hospital units. To be eligible for inclusion, the units had five or more staff nurse responses to the survey and 50% or higher response rates to assure that the unit was representative of the RN population (see Table 2, p. 48). For the final sample, there were 982 units in 2011 and 1,012 units in 2012 based on complete data on all variables for the analysis.

## **Registered Nurses (RNs)**

The study sample was limited to RNs participating in the 2011 and 2012 NDNQI<sup>®</sup> RN Surveys. RNs were employees of the hospitals using the selection criteria listed in Table 2 (p. 48). All data were aggregated to the unit level for analysis.

## **Measures**

This study utilized 2011 and 2012 NDNQI<sup>®</sup> RN Survey data from the PES along with other data collected from the NDNQI<sup>®</sup> member hospitals. Descriptive hospital information included facility variables (i.e., Magnet<sup>®</sup> status, teaching status, size, and location), a staffing

variable (i.e., RN hours per patient day), a skill mix variable (i.e., RN hours per patient day/total hours per patient day), and nurse characteristics (i.e., percent of the nurses who held a bachelor's degree or higher, percent certified, and average RN tenure).

## **RN Survey**

The NDNQI<sup>®</sup> RN Survey is offered as an annual, Web-based survey to NDNQI<sup>®</sup>-enrolled facilities. Hospitals can choose from one of six different data collection periods. The NDNQI<sup>®</sup> survey assists hospitals in identifying the needs of the RN staff to improve the work environment as the primary objective of participation. NDNQI<sup>®</sup> offers three RN survey options: (a) the RN Survey with the PES, (b) the RN Survey with the Job Satisfaction Scale; and (c) the RN Survey with the Job Satisfaction Scale-Short Form.

**RN Survey with PES.** Through factor analysis of the 1986 NWI, Lake (2002) empirically derived a set of subscales to measure and to describe the nurse work environment. This set of subscales was named the PES-NWI. The PES-NWI was selected by the National Quality Forum (n.d.) as a nursing care performance measure in 2004 and was added in 2006 as an option of the annual NDNQI<sup>®</sup> RN Survey (NDNQI<sup>®</sup>, n.d.).

The PES subscales have been used to assess the effects of the practice environment on nurse and patient outcomes (Lake, 2007). In this study, the PES subscales were used to measure the practice environment as depicted in the modified burnout mediation model (see Figure 1, p. 4).

The PES subscales measure the following: (a) policy involvement, (b) leadership, (c) quality of care, (d) staffing adequacy, and (e) RN and MD collaboration. All subscales have 4-point Likert-type response options of *strongly agree* (4) to *strongly disagree* (1), and nurses are instructed to indicate the extent to which they agree that the item is present in their current job.

A higher score on each of the subscales indicates more agreement that the subscale items are present in the current job situation. A mean score is calculated for each subscale with a mean range of one to four. Values above 2.5 indicate agreement; values below 2.5 indicate disagreement. The composite score is calculated as the total mean of all of the subscale means with a Cronbach's alpha reported as 0.82 (Lake, 2002). The five subscales of the PES with Cronbach's alphas of .71 to .84 (Lake, 2002) are discussed in more detail below.

***Policy involvement.*** Policy involvement is a 9-item subscale that is defined as the extent to which nurses feel they have an impact on overall hospital administration and have the opportunity to participate in policy decisions. Cronbach's alpha for this subscale for this study was .96 for the 2011 samples and .95 for the 2012 samples.

***Leadership.*** Leadership is a 5-item subscale that describes key elements of leadership of a nurse manager. Cronbach's alpha for this subscale for this study was .95 for both the 2011 and 2012 samples.

***Quality of care.*** Quality of care is a 10-item subscale that describes nurses' perceptions that the hospital supports a nursing model of care and nurses are clinically competent. Cronbach's alpha for this subscale for this study was .94 for the 2011 samples and .95 for the 2012 samples.

***Staffing adequacy.*** Staffing adequacy is a 4-item subscale describing nurses' evaluations of the adequacy of resources to meet demands (staffing), or enough staff to get the work done. Cronbach's alpha for this subscale for this study was .96 for both the 2011 and 2012 samples.

***RN and MD collaboration.*** RN and MD collaboration is a 3-item subscale that describes the quality of working relations between doctors and nurses in the hospital. Cronbach's alpha for this subscale for this study was .96 for the 2011 samples and .95 for the 2012 samples.

## **Burnout**

Burnout is a syndrome of emotional exhaustion, depersonalization, and lack of personal accomplishment that can occur among individuals who work with people. Emotional exhaustion (EE) describes feelings of being emotionally overextended and exhausted by an individual's work. Depersonalization (DP) is defined as an unfeeling and impersonal response toward recipients of an individual's service, care, treatment, or instruction. Lack of personal accomplishment (PA) describes feelings of incompetence and lack of achievement in an individual's work with people (Maslach, 2003). Burnout has been measured using the Maslach Burnout Inventory-Human Services Survey (MBI-HSS).

The burnout measures as measured by Maslach were not included in the NDNQI<sup>®</sup> database. However, two negatively worded items from the job enjoyment subscale (Taunton et al., 2004) were combined and used as a proxy measure to describe the burnout levels of the nurses who met the study sample inclusion criteria and completed the 2011 and 2012 NDNQI<sup>®</sup> RN Surveys. These two questions ask about the level of emotional exhaustion. The questions are similar to the emotional exhaustion questions on the MBI-HSS survey. The two items from the job enjoyment scale were worded as follows: (a) nurses with whom I work would say that they have to force themselves to come to work much of the time, and (b) nurses with whom I work would say that they feel that each day on their job will never end (see Appendix B). On each item, nurses indicate the extent to which they agree or disagree with each statement on a 6-point, Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (6). A mean scale score was created across the two items with a higher score indicating more burnout. The Guttman Split-half reliability for the scale was .94 for the 2011 samples and .94 for the 2012 samples.

## **Missed Care**

Missed nursing care is when any aspect of required patient care is omitted (either in part or in whole) or delayed (Kalisch et al., 2009). In a qualitative study, medical-surgical acute care nurses reported that they did not complete a significant amount of nursing care on a regular basis (Kalisch, 2006). Missed nursing care often is measured by the MISSCARE Survey. However, data from this survey is not included in the NDNQI® RN Survey.

Consequently, for this study, five questions were used as proxy measures to describe missed care by nurses completing the 2011 and 2012 NDNQI® RN Survey (see Appendix C). Nurses responded to five questions after being asked to think about their last shift worked: (a) I had enough help to lift or move patients; (b) I didn't have enough time to document care; (c) I had enough time to spend with each patient; (d) inadequate staffing either prevented or resulted in patient admissions, transfers, or discharges; and (e) discharged patients (or their caregivers) were prepared adequately for home care. Responses to these questions were marked as not applicable (0), no (1), or yes (2). Items were aggregated to the unit level to represent the percentage of nurses on the unit who endorsed each item. The positively worded items were then subtracted from 100 percent so that a higher score represented more missed care. An average percentage score was created by averaging across the five items to create one missed care score for each year of the data collection. Cronbach's alpha for this scale for this study was .83 for the 2011 samples and .81 for the 2012 samples.

## **Pressure Ulcer Prevalence Rate**

A nurse-sensitive outcome indicator reported in the NDNQI® database is the prevalence rate of hospital-acquired pressure ulcers (NDNQI®, n.d.), referred to as pressure ulcer prevalence rates (PUR). The ANA patient safety/nursing quality initiative panel developed the Nursing Care

Report Card for Acute Care that identified 10 indicators specific to nursing (ANA, 1995). Maintenance of skin integrity or pressure ulcers was identified as one of the 10 indicators (Gallagher & Rowell, 2011). A pressure ulcer is any lesion caused by unrelieved pressure, resulting in damage of underlying tissue (National Pressure Ulcer Advisory Panel, n.d.).

Data collected from the 2011 and 2012 NDNQI<sup>®</sup> quarterly clinical data collection were used to identify a unit prevalence rate of pressure ulcers in the study sample. Hospital units had to submit data at least three of four quarters to be included in the calculation. The annual prevalence rate was calculated by summing the unit number of hospital-acquired pressure ulcers across the quarters and dividing by the sum of the unit number of patients across the quarters. The annual prevalence rate of pressure ulcers is the number of patients with National Pressure Ulcer Advisory Panel Stage II, III, or IV ulcers divided by the number of patients in the prevalence study. Moderate to substantial reliabilities have been reported with overall  $\kappa$  coefficients reported for direct observation of the wounds (0.60-0.61), Web-based pictures (0.69), pressure ulcer identification (PU or no PU; 0.83), and origin (0.79; Berquist-Beringer, Gajewski, Dunton, & Klaus, 2011).

Pressure ulcer prevalence has been identified as a nurse-sensitive indicator (Gallagher & Rowell, 2003); thus, the pressure ulcer data collected in the NDNQI<sup>®</sup> prevalence study has been used as the outcome indicator for this study. The patient outcome in the study model (see Figure 1, p. 4) is dependent on the influence of the environment, nurse reaction (e.g., nurse burnout level), and nurse practice (e.g., missed care).



## **Procedures**

NDNQI<sup>®</sup> data are electronically collected through the Internet. Site coordinators of member hospitals enroll nursing units and submit all data using defined and demonstrated guidelines. Site coordinators confirm hospital and unit characteristics and submit indicator data on a quarterly basis.

NDNQI<sup>®</sup> offers the annual, Web-based RN Survey for a 3-week period during the months of April, May, June, August, September, and October. All member hospitals voluntarily register and schedule the month that nurses will participate in the RN Survey. From the NDNQI<sup>®</sup> Web site, site coordinators obtain a standardized Web data collection protocol and a unique hospital identification code. Each site coordinator identifies nursing units eligible to participate in the survey and enrolls them on the NDNQI<sup>®</sup> Web site, specifying the number of eligible RNs on each nursing unit. Individual names of RNs or individual identification codes are not collected to assure confidentiality of participation and anonymity of data.

Trained nurses collect the standardized pressure ulcer data and report unit data quarterly. Additional data related to patient admission pressure ulcer risk assessment are collected by unit using a total score from a standardized tool assessment that measures pressure ulcer presence on admission and, if an ulcer is present, from what type of facility did the patient transfer.

This study used the data from the 2011 and 2012 NDNQI<sup>®</sup> RN Surveys with PES-NWI and quarterly clinical data collection based on the study criteria listed in Table 2 (p. 48). All NDNQI<sup>®</sup> data are maintained in a secure data repository administered by research faculty and staff at a Midwestern academic medical center. Following approval from the academic medical center's Human Subjects Committee for human subjects' protection, data are de-identified and abstracted from the administrators of the NDNQI<sup>®</sup> project team prior to being sent to the

researcher for the study. The data were obtained using secured files from the NDNQI<sup>®</sup> research staff.

### **Data Analysis**

A secondary analysis of NDNQI<sup>®</sup> data was conducted at the unit level and files were analyzed using the SPSS version 22. *T* tests and ANOVA statistics were examined to assess for significant differences ( $p < .05$ ) in 2011 and 2012 data. This was followed by the examination of the correlations among work environment subscales, burnout, missed care, and the patient care outcome of pressure ulcer prevalence rate across both years.

A sequential regression analysis was conducted separately for both 2011 and 2012 data using a forward staged approach. For each year and for Models I, II, and III analyses, the unit level and hospital variables were controlled and entered in the first block. The independent variables (i.e., nurse PES subscales) were entered in the second block. For Model I, the relationships of the nurse PES subscales were examined with burnout being the dependent variable; data were entered in block as described above. For Model II, the relationships of the PES subscales and burnout were examined with missed care being the dependent variable. As described above, followed by the entry of the control variables in the first block and the PES subscales in the second block, burnout was entered in the third block. For Model III, the PES subscales of burnout and missed care were regressed on the hospital-acquired pressure ulcer prevalence rates (dependent variable); data again were entered in blocks as described above.

### **Summary**

The methodology used to examine the relationships of environmental worklife indicators, nurse burnout, and missed care with pressure ulcer prevalence rate in acute care hospital settings

using a modified model of nurse burnout (see Figure 1, p. 4) were described. This included the sample and setting, the procedures, the measures, and the data analysis.

## **Chapter IV**

### **RESULTS**

The results of the study are presented in Chapter Four. The aim of the study was to examine the relationships between hospital-acquired pressure ulcer prevalence rates in acute care hospital settings and environmental work life indicators, nurse burnout, and missed care using an adapted model of nurse burnout (see Figure 1, p. 4). Descriptive statistics were examined to assess for differences in variables between the two years of data collection. Correlation analysis was used to examine the relationships between work environment, burnout, missed care, and pressure ulcer prevalence rate within the two time points. Sequential multiple regression analyses were completed for each year separately to examine the relationships among the variables and make comparisons between the two years.

#### **Descriptive Analysis**

##### **Hospital Characteristics**

Upon reviewing the characteristics of the hospitals assigned to the units between the two years, 2011 and 2012, there were no significant differences in the characteristics noted among the hospitals studied (see Table 4). There were 30 more hospitals responding in 2012 than in 2011. The percentage of Magnet<sup>®</sup>-designated hospitals was slightly higher in 2012 (46.7%) than in 2011 (44.5%). The percentages of teaching status hospitals reporting, region represented, and bed sizes were very similar in each year. Nonteaching hospitals (44%) represented the largest sample of the hospitals included in the study. The southern region had the largest percentage of hospitals reporting with about 47%. Hospitals with 200-299 beds were the largest group of reporting hospitals with 23% reporting for 2011 and 25% reporting for 2012.

Table 4

*Hospital Characteristics of the Medical/Surgical Units as a Percentage of the Sample for 2011 and 2012*

Characteristic	2011 ( <i>n</i> = 982) %	2012 ( <i>n</i> = 1,012) %
Magnet®	44.5	46.7
Teaching status		
Academic medical center	18.5	18.3
Teaching	38.0	37.8
Nonteaching	43.5	43.9
Region		
Northwest	17.7	17.6
Midwest	20.1	20.0
South	46.5	47.3
West	15.7	15.1
Bed size		
< 100	4.1	4.3
100-199	18.3	17.8
200-299	23.2	25.0
300-399	16.6	17.2
400-499	16.6	16.1
> 500	21.2	19.6

### Unit Characteristics

The unit characteristics for units included in the sample also were very similar for each year (see Table 5). The mean RN hours per patient day were almost the same over the course of the two years, as well as the mean skill mix (i.e., RN hours per patient day/total hours per patient day). The unit types were also very similar over the two years, with the largest percentage

(approximately 43%) being represented by the combined adult medical-surgical units for each year.

Table 5

*Medical/Surgical Unit Characteristics for 2011 and 2012*

Characteristic	2011 ( <i>n</i> = 982)		2012 ( <i>n</i> =1,012)	
	<i>M (SD)</i>	%	<i>M (SD)</i>	%
Staffing RNHPPD	5.97 (1.21)		6.02 (1.11)	
Skill Mix RNHPPD/THPPD	8.78 (1.44)		8.85 (1.39)	
Unit type				
Adult medical		32.1		31.9
Adult surgical		24.3		24.4
Adult medical/surgical		43.6		43.7

*Note.* RNHPPD = Registered Nurse (RN) hours per patient day; THPPD= Total hours per patient day

### **Staff Characteristics**

The average age of nurses was 39 years for both 2011 and 2012 (see Table 6). On the unit total years worked were the same for both years. The percentage of male nurses was slightly greater in 2012 (8.2%) than in 2011 (7.7%) but not significantly different. There was no significant change of race between the two years, with Caucasians comprising 63% of the samples. Full-time employment status represented the largest category of employment status at 83%, with no change in any of the categories across the two years.

A slight change of reported degrees in education was noted between the two years. There was almost a 2% drop in associate's degrees (AD) from 2011 to 2012, with the same percentage of rise for Bachelor of Science (BS) degrees from 2011 to 2012. There was no change noted in Master of Science (MS) degrees or doctoral degrees from year to year; however, a 1% decrease in the diploma degree (DP) was noted from 2011 to 2012. Specialty certification of nurses rose 1% from 2011 to 2012. However, none of these differences were significant.

Table 6

*Staff Characteristics of Medical/Surgical Units for 2011 and 2012*

Characteristic	2011 ( <i>n</i> = 982)		2012 ( <i>n</i> = 1,012)	
	<i>M (SD)</i>	%	<i>M (SD)</i>	%
Age	39.18 (4.27)		39.09 (4.38)	
Total years on unit	5.68 (2.49)		5.77 (2.53)	
Total years worked	9.84 (3.54)		9.76 (3.48)	
Gender				
Female		92.3		91.8
Male		7.8		8.2
Race				
White		63.6		63.2
Black		10.4		10.3
Asian		14.8		14.7
Hispanic		4.6		4.9
Other		6.6		6.9
Employment status				
Full time		83.4		83.2
Part time		12.6		12.8
PRN		4.0		4.0
Contract		0.0		0.0
Nurse education level				
AD		40.5		38.6
DP		6.2		5.3
BS		50.2		52.9
MS		3.0		3.1
Doctorate		0.1		0.1
Specialty certification				
Yes		15.0		16.0
No		85.0		84.0

*Note.* PRN = pro re nata (as needed); AD = associate's degree;  
DP = diploma degree; BS = bachelor's degree; MS = master's degree.



## Variables of Interest

**Practice Environment Scale.** The work environment of nurses as measured by the PES subscales and total score was not different between 2011 and 2012 (see Table 7). All of the mean scores were above the midpoint of 2.5, indicating nurses' agreement with the statements for each subscale. The mean nurses' responses on the quality of care subscale was the highest (3.12 and 3.15, respectively) for the PES subscales for 2011 and 2012. This represented the degree of nurses' overall average perceptions that the hospital supported a nursing model of care and that nurses were clinically competent. The staffing resources subscale, measuring the adequacy of resources to meet staffing demands or enough staff to get the work done, was the lowest of the PES subscales ( $M = 2.59$  in 2011 and  $M = 2.62$  in 2012).

**Burnout.** Burnout was measured by proxy using two questions on the job enjoyment scale that were negatively worded. The level of burnout was identical for each year (see Table 7). The mean values of 3.38 and 3.59 for 2011 and 2012, respectively, were indicative of slight burnout level when compared to the midpoint of 3.5.

**Missed care.** Five questions served as proxy measures for missed care. Adequate discharge preparation was the highest missed care activity in both years. All values for each were essentially the same across both years. The average missed care score was 71%, indicating that a great deal of missed care was reported on the last shift worked (see Table 7).

**Pressure ulcer prevalence rates.** The hospital-acquired pressure ulcer prevalence rates for the units was slightly higher in 2011 ( $M = 0.018$ ) than in 2012 ( $M = 0.014$ ; see Table 7). However, the average rates across the two years were very small.

Table 7

*Mean Unit Scores for Practice Environment Subscales and Total Score, Burnout, Missed Care, and Pressure Ulcer Prevalence Rates for 2011 and 2012*

Characteristic	2011 ( <i>n</i> = 982)		2012 ( <i>n</i> = 1,012)	
	<i>M</i> ( <i>SD</i> )	%	<i>M</i> ( <i>SD</i> )	%
PES subscales				
Hospital affairs	2.90 (0.27)		2.93 (0.26)	
Quality of care	3.12 (0.20)		3.15 (0.20)	
Nurse manager	2.98 (0.33)		3.02 (0.33)	
Staffing resources	2.59 (0.35)		2.62 (0.35)	
Nurse/physician collaboration	2.98 (0.24)		3.01 (0.24)	
Total PES score	2.92 (0.24)		2.95 (0.24)	
Burnout				
Force themselves to come to work	3.38 (0.54)		3.37 (0.54)	
Feel each day on the job will never end	3.59 (0.50)		3.58 (0.51)	
Mean burnout score	3.49 (0.52)		3.48 (0.53)	
Missed care				
Had enough help lifting		75.89		76.62
Had enough time		52.80		54.01
Inadequate document time		63.60		64.46
Adequate discharge Preparation		90.12		90.12
Staffing affected patient movement		72.85		73.51
Mean missed care score		71.05		71.74
Pressure ulcer prevalence rate	0.018 (0.026)		0.014 (0.022)	

*Note.* PES = Practice Environment Scale.

### **Primary Aim**

The primary aim of the study was to examine the relationships between the pressure ulcer prevalence rate in medical and surgical inpatient hospital units and environmental worklife indicators, nurse burnout, and missed care. Variables in the model were examined prior to inclusion in model testing. Linear multiple regression procedures were used to examine the hypothesized model relationships.

### **Selection of Model Variables**

#### **Unit Characteristics**

Zero-order correlations of staffing (i.e., RN hours per patient day), skill mix (i.e., RNHPPD/THPPD), and nurse characteristics (i.e., RN staff specialty certification, total years worked on the unit, and nurses with BS or higher degrees) with pressure ulcer prevalence rates, burnout, and missed care were examined (see Table 8). Total years worked on the unit and BS or higher degrees were not statistically significant in either year with pressure ulcer prevalence rates, burnout, and missed care. Thus, both total years worked on the unit and nurses with BS or higher degrees were eliminated from further model testing.

Although certification did not have significant correlations with pressure ulcer prevalence rates, it was significantly ( $p < .01$ ) associated with both burnout and missed care for 2011 and 2012 (see Table 8). Examination of the zero-order correlations for staffing (i.e., RNHPPD) and skill mix (i.e., RNHPPD/THPPD) also revealed small but statistically significant ( $p < .05$ ) correlations with pressure ulcer prevalence rates, burnout, and missed care in 2011; however, there was only a significant ( $p < .05$ ) correlation with burnout in 2012. A decision was made to retain both variables for further model testing in both years.

Table 8

*Correlations for Unit Characteristics with Pressure Ulcer Prevalence Rates, Burnout, and Missed Care*

Unit characteristics	2011				2012			
	PUR	BO	MC		PUR	BO	MC	
Certification yes	-0.02	-0.24**	-0.17**		-0.01	-0.19**	-0.12**	
RNHPPD	-0.06*	-0.19**	-0.18**		-0.07*	-0.15**	-0.13**	
RNHHD/THPPD	-0.03*	-0.08*	-0.06		-0.02	-0.08*	-0.02	
Total years worked								
on unit	-0.00	0.01	0.05		0.01	-0.05	-0.03	
BS or higher	-0.04	-0.05	0.05		0.00	-0.04	0.02	

*Note.* PUR = Pressure Ulcer Prevalence Rate; BO = Burnout; MC = Missed Care; HPPD = Hours Per Patient Day

\* $p < .05$ . \*\* $p < .01$ .

## Hospital Characteristics

Differences in pressure ulcer prevalence rates were examined by hospital level variables (i.e., teaching status, bed size, region, and Magnet<sup>®</sup> status). ANOVA analysis revealed that there were significant overall differences in pressure ulcer prevalence rates by teaching status in 2011 ( $F_{(2,979)} = 4.27; p < .001$ ; see Table 9) and 2012 ( $F_{(2,1009)} = 10.32; p < .001$ ; see Table 10). Post-hoc tests revealed that there were significant mean differences between academic medical centers versus teaching and nonteaching hospitals. Consequently, a dichotomous variable was created for model testing where academic medical center teaching status was coded as one and all others were represented by zero for both 2011 and 2012. For 2011, pressure ulcer prevalence rates were not significantly different ( $p > .05$ ) by bed size, region, or Magnet<sup>®</sup> status; thus, these variables were not included in the model testing for 2011. For 2012, ANOVA analysis revealed that there was an overall statistical difference ( $F_{(5,1006)} = 3.07, p < .01$ ) in pressure ulcer prevalence rates by bed size. Post-hoc tests revealed that hospitals with less than 100 beds were different from all other hospital bed sizes; a dichotomous variable was created with bed size less than 100 coded as one and all other bed sizes coded as zero. This variable was included in the analysis for 2012 only. There also was a statistical difference by Magnet<sup>®</sup> status ( $t_{(972)} = -2.71, p = .01$ ); thus, this variable was included in the 2012 analysis. There were no statistical differences by region (see Table 10), so this variable was not included in the analysis for 2012.

Table 9

*Mean Pressure Ulcer Prevalence Rates by Hospital Characteristics for Medical/Surgical Units in 2011*

Variable	Mean	Statistic	<i>p</i>
<b>Teaching status</b>		$F_{(2,979)} = 4.27$	.01*
Academic*	0.023		
Teaching status	0.018		
Nonteaching	0.016		
Total	0.018		
<b>Bedsizes</b>		$F_{(5,976)} = 1.57$	0.17
<100	0.012		
100-199	0.018		
200-299	0.016		
300-399	0.017		
400-499	0.018		
> 500	0.022		
Total	0.018		
<b>Region</b>		$F_{(3,978)} = 1.11$	0.34
Northwest	0.020		
Midwest	0.015		
South	0.019		
West	0.019		
Total	0.018		
<b>Magnet<sup>®</sup></b>			
Yes	0.018	$t_{(980)} = -.44$	0.66
No	0.018		

\* Significantly different than other groups.

Table 10

*Mean Pressure Ulcer Prevalence Rates by Hospital Characteristics for Medical/Surgical Units in 2012*

Variable	Mean	Statistic	<i>p</i>
<b>Teaching Status</b>		$F_{(2,1009)} = 10.32$	.000**
Academic*	0.020		
Teaching status	0.012		
Nonteaching	0.013		
Total	0.014		
<b>Bedsizes</b>		$F_{(5,1006)} = 3.07$	.01**
<100*	0.007		
100-199	0.015		
200-299	0.012		
300-399	0.012		
400-499	0.016		
> 500	0.017		
Total	0.014		
<b>Region</b>		$F_{(3,1008)} = 1.866$	0.13
Northwest	0.017		
Midwest	0.012		
South	0.014		
West	0.012		
Total	0.014		
<b>Magnet<sup>®</sup></b>			
Yes*	27.23	$t_{(972)} = -2.71$	.01*
No	29.18		

\* Significantly different than other groups.

## **Correlation Analysis of Model Variables**

Examination of the correlations among the PES subscales revealed that the five subscales were moderately to highly correlated in 2011 ( $r = .51-.87$ ) and in 2012 ( $r = .55-.88$ ; see Table 11). The annual pressure ulcer prevalence rate was correlated significantly ( $p < .05$ ) with the mean scores for burnout and missed care in 2012, but not in 2011 (see Table 11). Additionally, the pressure ulcer prevalence rate was significantly correlated with the hospital affairs and nurse/physician relations subscales in both 2011 and 2012. Burnout and missed care had moderately to highly significant correlations with each of the subscales of the PES in each year (see Table 12).



Table 11

*Correlations Among the PES Subscales for 2011 and 2012*

Variables	2011					2012				
	HA	QC	NM	SR	NP	HA	QC	NM	SR	NP
PES HA	---					---				
PES QC	.87**	---				.88**	---			
PES NM	.75**	.77**	---			.75**	.73**	---		
PES SR	.75**	.76**	.70**	---		.74**	.75**	.69**	---	
PES NP	.62**	.67**	.51**	.59**	---	.64**	.71**	.55**	.58**	---

*Note.* PES = Practice Environment Scale; HA = Hospital Affairs; QC = Quality of Care; NM = Nurse Manager; SR = Staffing Resources; NP = Nurse/Physician.

\* $p < .05$ . \*\* $p < .01$ .

Table 12

*Correlations Between Pressure Ulcer Prevalence Rate, Burnout, and Missed Care with the PES Subscales for 2011 and 2012*

Variables	PUR	2011 BO	MC	PUR	2012 BO	MC
PUR	1.00	0.06	0.06	1.00	0.07*	0.08*
BO	0.06	1.00	0.71**	0.07*	1.00	0.72**
PES HA	0.06*	-0.65**	-0.62**	-0.06*	-0.62**	-0.58**
PES QC	-0.05	-0.65**	-0.63**	-0.02	-0.64**	-0.59**
PES NM	-0.01	-0.68**	-0.59**	-0.04	-0.67**	-0.56**
PES SR	0.04	-0.77**	-0.85**	-0.04	-0.75**	-0.82**
PES NP	-0.08*	-0.55**	-0.48**	-0.06*	-0.52**	-0.44**

*Note.* PU = Pressure Ulcer Prevalence Rate; BO = Burnout; MC = Missed Care; PES = Practice Environment Scale; HA = Hospital Affairs; QC = Quality of Care; NM = Nurse Manager; SR = Staffing Resources; NP = Nurse/Physician.

\* $p < .05$ . \*\* $p < .01$ .

### **Assumption Testing for Multiple Regression Analysis**

Prior to conducting the analysis, the evaluation of the assumptions of multiple regressions was completed for each analysis for 2011 and 2012. Independence of the data points was tested by the Durbin-Watson calculation. In each case, the values were found to be between 1.5 and 2.5, suggesting independence. Multicollinearity was reviewed by evaluating the tolerance and variance inflation factor (VIF) values. Tolerance was noted above .04 in all models as recommended. VIF values equal to or less than 10 are recommended and were found within this limit in each model tested. Standard errors (*SEs*) were noted as not large, indicating no multicollinearity. Although the values for multicollinearity were within normal ranges, moderate

to high intercorrelations among the subscales of the PES-NWI were of concern and presented possible issues in the analysis that will be discussed in the model testing results.

Standard residuals were reviewed; all of the minimum and maximum values were within the recommended range of -3.5 to 3.5. Scatter plots were reviewed with some curvilinear patterns noted with the pressure ulcer prevalence rates. Skewness of the pressure ulcer rate was noted as expected with the small rate value within the large sample size. The large sample size would account for the robustness of the violations of the model assumptions, given skewness of the dependent variable.

### **Sequential Model Testing**

**Model I: Burnout.** For burnout, the adjusted  $R^2$  (.65) in 2011 indicated about 65% of the variance for burnout was predicted by the linear weighted combination of variables in the model. The variables that were significantly related to burnout were the control variables of RN hours per patient day (RNHPPD) and specialty certification as well as the PES subscales of nurse manager, staffing resources, and nurse/physician relationships (see Table 12 and Figure 2).

In 2012, the adjusted  $R^2$  (.62) for burnout indicated a slight decrease from 2011, with about 62% of the variance predicted by the linear weighted combination of variables in the model. The significant variables of burnout in 2012 were the control variables of academic status, bed size of less than 100 (bed size < 100), RN hours per patient day (RNHPPD), and specialty certification as well as the PES subscales of nurse manager, staffing resources, and nurse/physician relationships (see Table 13 and Figure 3).

**Model II: Missed care.** The adjusted  $R^2$  (.73) in 2011 indicated that 73% of the variance for missed care was predicted by the linear weighted combination of variables in the model with burnout having a significant direct effect on missed care. The other significant variables were

academic status (the control variable) and the PES subscale staffing resources (see Table 12 and Figure 2).

In 2012, the adjusted  $R^2$  (.71) indicated 71% of the variance for missed care was predicted by the linear weighted combination of variables in the model. Again, burnout had a significant direct effect on missed care, along with the control variables of Magnet<sup>®</sup> status and specialty certification as well as the PES subscales of quality care and staffing resources (see Table 13 and Figure 3).

**Model III: Pressure ulcer prevalence rates.** Regression analysis was done to answer the following research question: Controlling for facility variables (i.e., teaching status, size, location, Magnet<sup>®</sup> status), staffing (i.e., RN hours per patient day), and skill mix (i.e., RN hours per patient day/total hours per patient day, percent of nurses with a bachelor's degree, percent certified, average RN tenure), what is the relationship between the nursing environmental factors measured by the PES subscales (i.e., nurse manager leadership, RN/MD collaboration, policy involvement, staffing adequacy, and nursing model of care), burnout, and missed care and the patient outcome (i.e., pressure ulcer prevalence rate).

Neither burnout nor missed care had significant direct effects for the pressure ulcer prevalence rates in either 2011 or in 2012 (see Tables 13 and 14). However, there were other variables that impacted pressure ulcer prevalence rates and other interesting findings between the PES subscales, burnout, and missed care within the model; the results are presented below.

In 2011, the adjusted  $R^2$  (.01) indicated that about 1% of the variance in the pressure ulcer prevalence rate was predicted by linear weighted combination of variables in the model (see Table 13). The only significant predictor of the annual pressure ulcer prevalence rate was the academic teaching status of the hospital. In 2012, the adjusted  $R^2$  (.03) indicated about 3% of the

variance in the pressure ulcer prevalence rate was predicted by the linear weighted combination of variables in the model. However, in 2012, four variables (academic teaching status, RNHPPD, the PES subscale hospital affairs, and the PES subscale quality of care) were significant variables for the pressure ulcer prevalence rate (see Table 14).

Table 13

*2011 Sequential Regression Analysis Presented for Models I, II, and III*

Dependent Variable	Model I			Model II			Model III		
	<i>b</i>	<i>Beta</i>	<i>p</i>	<i>b</i>	<i>Beta</i>	<i>p</i>	<i>b</i>	<i>Beta</i>	<i>p</i>
Academic status	0.16	0.02	0.25	-0.76	-0.05	0.01**	-0.00	-0.08	0.02*
RNHPPD	-0.02	-0.05	0.04*	0.28	0.03	0.18	-0.00	-0.07	0.08
RNHHD/THPPD	0.14	0.02	0.32	-3.57	-0.03	0.22	0.00	0.01	0.84
Certification yes	-0.00	-0.06	0.01**	0.03	0.03	0.06	0.00	0.01	0.84
PES HA	0.00	0.00	1.00	1.15	0.03	0.48	-0.01	-0.13	0.07
PES QC	0.19	0.07	0.10	0.20	0.00	0.93	0.00	0.03	0.65
PES NM	-0.44	-0.29	0.00**	1.51	0.04	0.15	0.01	0.09	0.10
PES SR	-0.75	-0.54	0.00**	-26.34	-0.80	0.00**	0.01	0.09	0.29
PES NP	-0.23	-0.11	0.00*	2.07	0.04	0.07	-0.01	-0.08	0.08
Burnout	---	---	---	3.99	0.17	0.00*	0.00	0.03	0.59
Missed Care	---	---	---	---	---	---	0.00	0.03	0.64
	<i>R</i> <sup>2</sup>	<i>ADJ R</i> <sup>2</sup>	<i>F</i>	<i>R</i> <sup>2</sup>	<i>ADJ R</i> <sup>2</sup>	<i>F</i>	<i>R</i> <sup>2</sup>	<i>ADJ R</i> <sup>2</sup>	<i>F</i>
	0.65	0.65	189.89	0.74	0.73	256.76	0.02	0.01	1.78
			0.00**			0.00**			0.05

Table 14

2012 Sequential Regression Analysis Presented for Models I, II, and III

Dependent Variable	Model I			Model II			Model III					
	BO			MC			PUR					
	<i>b</i>	<i>Beta</i>	<i>p</i>	<i>b</i>	<i>Beta</i>	<i>p</i>	<i>b</i>	<i>Beta</i>	<i>p</i>			
Academic status	0.04	0.05	0.03*	-0.48	-0.03	0.13	-0.00	-0.11	0.00**			
Bed size >100	0.04	0.11	0.00**	-0.16	-0.02	0.33	0.00	0.04	0.29			
Magnet status	0.02	0.01	0.51	-1.54	-0.07	0.00**	-0.00	-0.03	0.36			
RNHPPD	-0.03	-0.07	0.00**	0.03	0.00	0.88	-0.00	-0.10	0.01**			
RNHPPD/THPPD	0.08	0.01	0.61	2.78	0.02	0.35	0.01	0.02	0.59			
Certification yes	-0.00	-0.04	0.05*	0.04	0.05	0.01**	0.00	0.02	0.64			
PES HA	0.12	0.06	0.19	-1.28	-0.03	0.47	-0.01	-0.17	0.02*			
PES QC	-0.08	-0.03	0.50	8.20	0.14	0.00**	0.02	0.20	0.02*			
PES NM	-0.47	-0.30	0.00**	1.49	0.04	0.15	-0.00	-0.01	0.91			
PES SR	-0.74	-0.51	0.00**	-23.59	-0.74	0.00**	0.01	0.09	0.21			
PES NP	-0.16	-0.08	0.01**	1.30	0.03	0.27	-0.01	-0.08	0.08			
Burnout	---	---	---	6.39	0.29	0.00**	0.00	0.01	0.80			
Missed Care	---	---	---	---	---	---	0.00	0.08	0.18			
	<i>R</i> <sup>2</sup>	<i>ADJ R</i> <sup>2</sup>	<i>F</i>	<i>p</i>	<i>R</i> <sup>2</sup>	<i>ADJ R</i> <sup>2</sup>	<i>F</i>	<i>p</i>	<i>R</i> <sup>2</sup>	<i>ADJ R</i> <sup>2</sup>	<i>F</i>	<i>p</i>
	0.63	0.62	145.75	0.00*	0.71	0.71	196.95	0.00**	0.04	0.03	2.88	0.00**

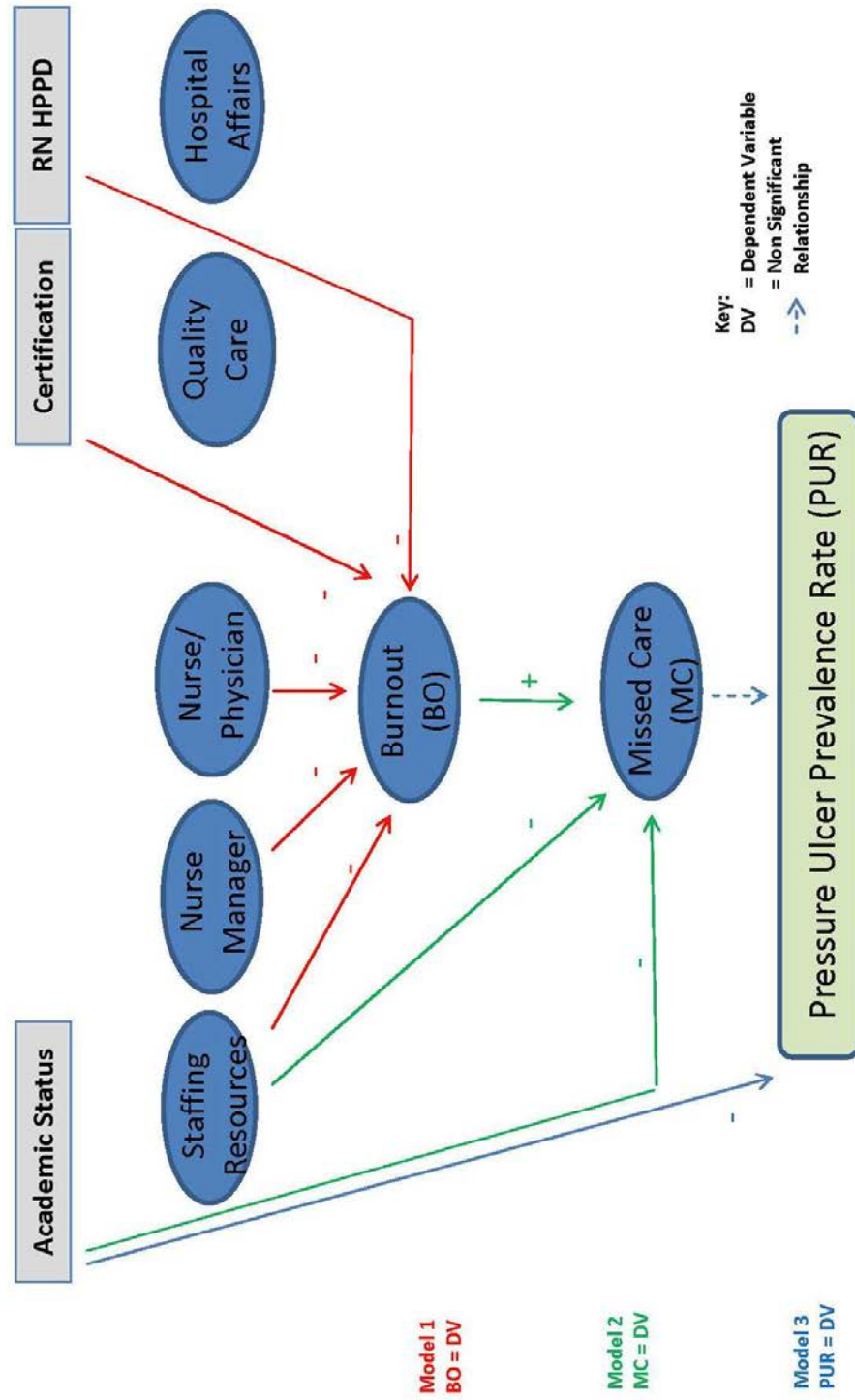


Figure 2. 2011 model testing with five subscales of Practice Environment Scale (PES): hospital affairs, quality care, nurse/physician relationships, nurse manager relationships, and staffing resources. RNHPPD = RN hours per patient day.



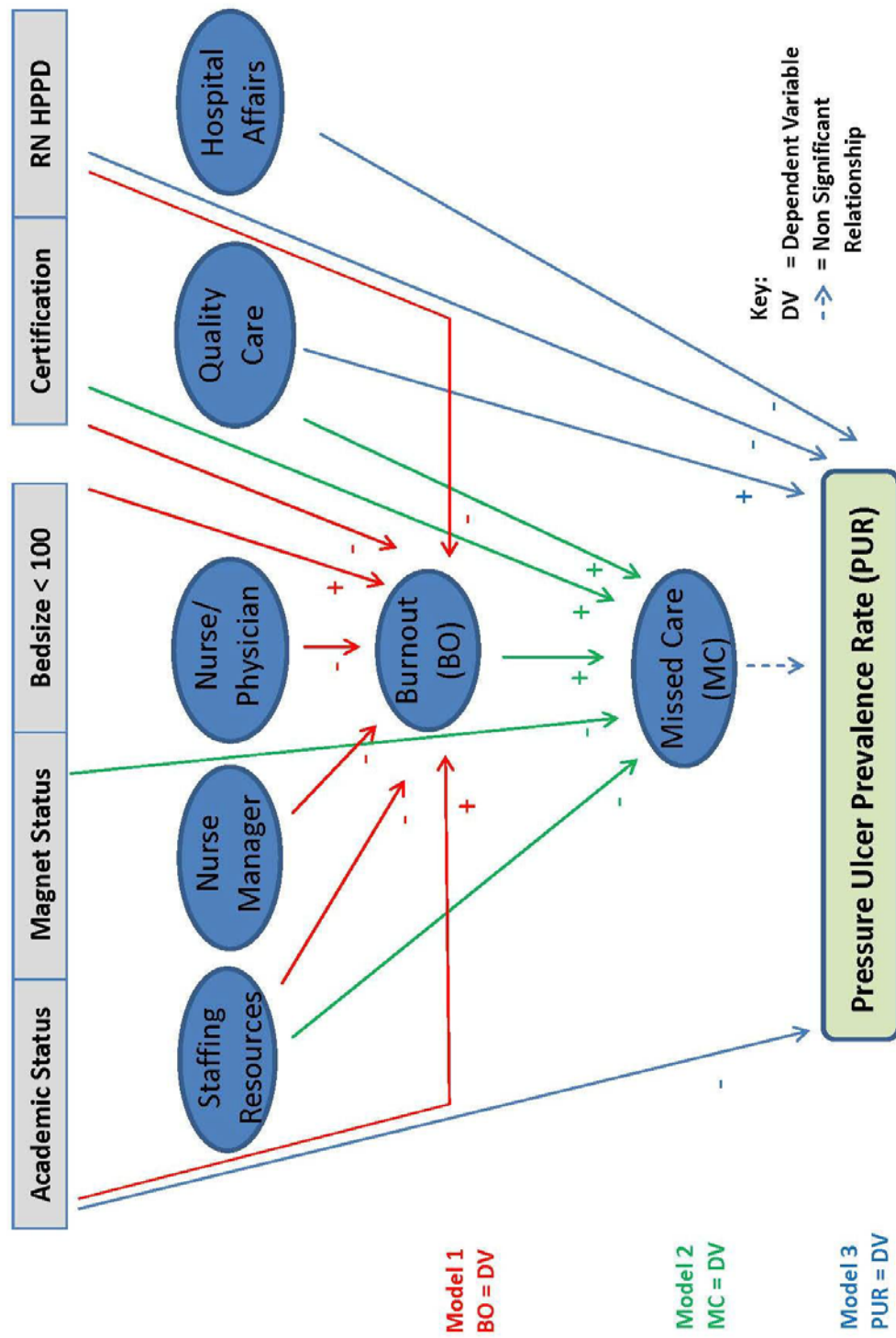


Figure 3. 2012 model testing with five subscales of Practice Environment Scale (PES): hospital affairs, quality care, nurse/physician relationships, nurse manager relationships, and staffing resources. RNHPPD = RN hours per patient day.

## **Summary**

The results of the study described in Chapter Four examined the relationships between pressure ulcer prevalence rates in acute care hospital settings and environmental worklife indicators, nurse burnout, and missed care using an adapted model of nurse burnout (see Figure 1, p. 4). For 2011, the variance explained by the linear weighted combination of variables for pressure ulcer prevalence rates was nonsignificant; however, in 2012, the variance explained by the linear-weighted combination of variables for pressure ulcer prevalence rate was statistically significant. There were no direct significant relationships between burnout or missed care with pressure ulcer prevalence rates for both 2011 or 2012. However, other findings within the model were described. The study was the first step in describing the relationships of the variables in the model with pressure ulcer prevalence rates at the unit level. Chapter Five discusses the results and implications of the findings and recommendations for future research.

## **Chapter V**

### **DISCUSSION, IMPLICATIONS, AND CONCLUSIONS**

Chapter Five presents a discussion of the findings of the study aim and the utility of the model. Additionally, this chapter reviews the contribution of this study to nursing practice and patient safety research. Figures 2 and 3 (pp. 79-80) depict the variables significant in the model.

The primary aim of this study was to examine the relationships of environmental worklife indicators measured by the PES scale, nurse burnout, and missed care with the hospital-acquired pressure ulcer prevalence rate in acute care hospital settings using an adapted model of nurse burnout. Although no direct relationships were found between burnout or missed care with pressure ulcer prevalence rates, there were other findings within the model that can be helpful for further study and consideration.

#### **Significance of the Study**

Within the very complex environment of health-care systems, nurses adapt to the environment with new information. Examining this relationship between environmental factors and each nurse's practice choices provided new knowledge to understand the decisions that nurses make daily. Thus, studying these relationships could cultivate the emergence of new ideas that may influence each nurse's adjustments and adaptations to his or her environment in a more positive way, thus contributing to better care and patient outcomes.

#### **Literature Review Update**

The literature was reviewed following the completion of the study, and no additional studies were found involving hospitals in the United States. However, a relevant study was completed in several Belgian hospitals in 2013. Using a cross-sectional survey design of 1,108 nurses in 96 acute care nursing units (including medical/surgical, critical care, emergency

department, and perioperative units), the study reported that environmental worklife indicators (measured using the PES subscales) and burnout levels of nurses were important predictors of nurse-reported outcome variables, including patient falls, nosocomial infections, and medication errors (Van Bogaert et al., 2013). Pressure ulcer prevalence rates were not studied; thus, comparisons to the findings from this study cannot be done.

## **Discussion of Findings**

### **Pressure Ulcer Prevalence Rates**

Figures 2 and 3 depict the significant variables in the model. In 2011, a medical center's academic teaching status was the only variable that had a significant negative direct effect on pressure ulcer prevalence rate. Academic teaching status also had significant, negative relationship in 2012. Similar to what is reported in the literature (Bergquist, Lei Dong, & Dunton, 2013), findings from this study revealed that large hospitals with academic teaching status are associated with lower pressure ulcer prevalence rates. However, one must take into consideration the low percentage of overall pressure ulcer prevalence rates in academic medical centers (1.8% for each year) in the sample studied. This sample also included a higher percentage of Magnet<sup>®</sup> status hospitals than the general population (44% in 2011 and 46% in 2012). Magnet<sup>®</sup> hospital status may suggest that lower pressure ulcer rates would be expected in such facilities; however, this was a nonsignificant finding in both 2011 and 2012 in this study.

In 2012, the PES subscales of hospital affairs (HA) and quality of care (QC) had significant relationships with the pressure ulcer prevalence rate. The HA subscale measures the extent to which nurses feel they have impact on hospital administrative policy. The HA subscale had a negative direct effect on the pressure ulcer prevalence rate, which could be explained by

hospital policies that focus on risk assessment practices that have been shown to reduce pressure ulcers.

The QC subscale measures the nurses' perceptions of the hospital support for quality and that nurses are clinically competent. Of all the PES subscales in 2012, the QC subscale had the highest mean score across the units. The small, statistically significant positive correlation between the QC subscale and pressure ulcer prevalence rate would indicate that if nurses perceive higher quality of care, the pressure ulcer prevalence rates were higher. This finding was not expected and needs further exploration. However, when examining the statistically significant *b* and *Beta* weights from the regression analysis, there was a sign switch that indicated a negative association between QC and pressure ulcer prevalence rates. This indicated suppression probably due to the high intercorrelations among all of the PES subscales ( $r = .55-.88$ ). This finding requires further analysis using more advanced statistical modeling techniques like structural equation models to determine what variables are contributing to the suppression.

If nurses perceive higher quality of care, the outcome of lower pressure ulcer prevalence rates with Magnet<sup>®</sup> status hospitals could be expected, which is similar to previously reported findings in the literature (Bergquist et al., 2013). A negative association of the QC subscale with pressure ulcer prevalence rates also would align with the focus on competent nurses to assess risk of pressure ulcers, with the result that pressure ulcers are less likely to develop (Bergquist et al., 2013); however, the positive relationship indicated in this analysis is difficult to explain.

In 2012, the RN hours per patient day (RNHPPD) had a negative association with the pressure ulcer prevalence rate. This means that the fewer the number of RNHPPD, the higher the pressure ulcer prevalence rate. This is in alignment with the assumption that higher staffing levels with more RNs at the bedside delivering direct care would yield less pressure ulcer

development. This assumption is supported by reported evidence that adequate staffing and balanced workloads are central to achieving good outcomes (Unruh, 2008).

### **Missed Care**

Comparing the models between the two years, the academic teaching status of a hospital had a direct effect on missed care in 2011, but this finding was not supported in 2012. This would be an area to review in future research studies using multiple years to evaluate whether this was a spurious finding in 2011. Appreciating the complexity of care and using the assumption that more complex issues and care requirements of patients present in academic medical centers, the finding could be explained by the patient population requirements and nurses having more opportunity to miss care in academic medical centers.

In 2011, the PES subscale of staffing resources (SR) was the only subscale of the PES that had a negative direct effect on missed care. This same negative relationship for staffing resources also was found in 2012. Those units with less staffing had higher levels of missed care, as would be expected. This finding is aligned with the literature that determined that too few staffing resources resulted in missed care (Kalisch, 2006).

In 2012, the PES subscale of quality of care (QC) had a significant, positive direct effect on missed care. Without the other variables in the model, the correlation between QC and missed care was positive indicating that higher quality would be associated with higher pressure ulcer prevalence rates. Once again, there is a suppression effect causing a change in the sign from positive to negative. The QC subscale measures the nurses' perceptions of their competency and the input of competent nurses. Thus, it can be assumed that competent nurses would have more awareness and be more likely to report missed care. However, this needs

further exploration to understand the true nature of the relationship between quality of care and missed care.

Of the sample studied in 2012, almost half of the hospitals had achieved Magnet<sup>®</sup> status (46%), which was also significant. Findings from this study indicated that hospitals that had achieved Magnet<sup>®</sup> status had less missed care; both the HA subscale and the QC subscale measures align with the Magnet<sup>®</sup> status because both suggest higher quality and nursing competency that one would expect to find in these hospitals. Also, in 2012, the unit level indicator of specialty certification of nurses had a significant positive impact on missed care. Care provided by RN staff who had received additional training, as evidenced by specialty certification, should result in the development of fewer pressure ulcers; however, the finding in this study was the opposite of what was expected. Further research is needed to explore whether this is a spurious finding, or if this would be found in future evaluations of the model. Additionally, in future studies, the proxy measures for missed care in this study should be tested for validity and reliability.

## **Burnout**

In both 2011 and 2012, the PES subscales of nurse manager ability (NM), staffing resources adequacy (SR), and the nurse-physician relationship (NP) had significant negative direct impact on burnout. The NM subscale measures the leadership qualities of the nurse manager as perceived by the staff nurses. The NP subscale measures the working relationships between nurses and doctors as recognized as desirable for a positive working environment (Lake, 2002). Burnout has been associated strongly with the environment of care factors that these three subscales (NM, SR, and NP) measure (Aiken et al., 2000). The findings are consistent with previous research; lower mean scores on these PES subscales result in a higher burnout rate.

In 2011, the staffing variable RNHPPD had a significantly negative direct effect on burnout. Higher RNHPPD is aligned with the PES subscale staff resources (SR); thus, higher staffing levels produced lower burnout. Specialty certification also had a negative direct impact on burnout in each year. Higher competency of nurses might suggest less burnout because of the confidence and expertise of certified nurses being less susceptible to burnout.

Hospitals with fewer than 100 beds had a direct impact on burnout in 2012, but not in 2011. Further study would be needed to identify if a pattern could be determined and explore reasons of such. Possibly, smaller organizations have fewer resources and require nurses to be able to meet the care demands of units that provide care for a wide range of patients, thus leading to higher burnout levels. The proxy measures of burnout used in this study need to be further tested for validity and reliability. This was the first reported study using these proxy measures for burnout; thus, further research is needed to build upon the findings.

### **Future Model Testing**

Health-care environments are undergoing constant change in all facets of operations, including technology, processes, and methods; this has added complexity to the environment. With the advent of the IOM's *To Err Is Human* report in 2000, a new conceptualization began to visualize health care as a complex system. Nursing behaviors are influenced by a variety of environmental factors and include the levels of burnout present producing nursing practice patterns (i.e., levels of missed care) leading to patient outcomes (hospital-acquired pressure ulcer prevalence rate as described in this study). Viewing health care as a complex system could help discover patterns that contribute to errors and specific interventions to reduce errors of missed care and burnout.



Complex adaptive systems (CAS) contain variables that interact in their environment to self-organize and change; thus, even small changes can lead to large outcomes. This is known as complexity science (Casti, 1994). Nurses are educated to use the scientific model in assessing situations, planning actions, and evaluating the results. A linear model, as was used in this study, does not appreciate the human-environment process that realizes that small changes in human interactions can affect large outcome changes

One approach for exploration into this topic is to use complexity science methodology that acknowledges the nonlinear nature of the health-care environment. Complexity science in the context of nursing practice has the power to promote a deeper understanding of nurses as they evolve within the environment (Davidson, Ray, & Turkel, 2011). Choosing the best actions (ethical, physical, moral, and spiritual) for patients is based on information from the multidimensionality of patients' and families' clinical experiences that is gathered by nurses and other professionals who have the knowledge and intention to change the delivery of care.

Complex phenomena in a social network such as the health-care environment are neither absolutely predictable nor random but are described with distributions or patterns of possible futures. In most empirical studies, models are used that study organizations using a set of independent variables to explain variation in one or more dependent variables. Most often, outcomes at one level are explained by causal drivers at the same level of analysis. CAS models use a different approach. Asking how changes in the agents' decisions rule the interconnections among the agents or the function of fitness that the agents use produces different aggregate outcomes (Anderson, 1999).

Causal models and CAS models are complementary, not competing. Causal theories relate variables on the same level and then identify important aggregate regularities and factors that help create them (as in this study). Building on the first step of analysis as done in this study, CAS models explain observed regularities as the product of structured, evolving interactions among units (Anderson, 1999).

### **Proposed Future Model for Testing**

Appreciating the interaction of the environmental factors among each other and with the elements of burnout, missed care, and patient outcomes, a proposed new model for testing is offered (see Figure 4). The multidirectional arrows among the environmental factors, burnout elements, missed care, and the patient outcome (hospital-acquired pressure ulcer prevalence rate) depict the feedback loops and the evolving interactions of such. As described by Anderson (1999), good CAS models explain established findings as well as predict aggregate-level causal relationships.

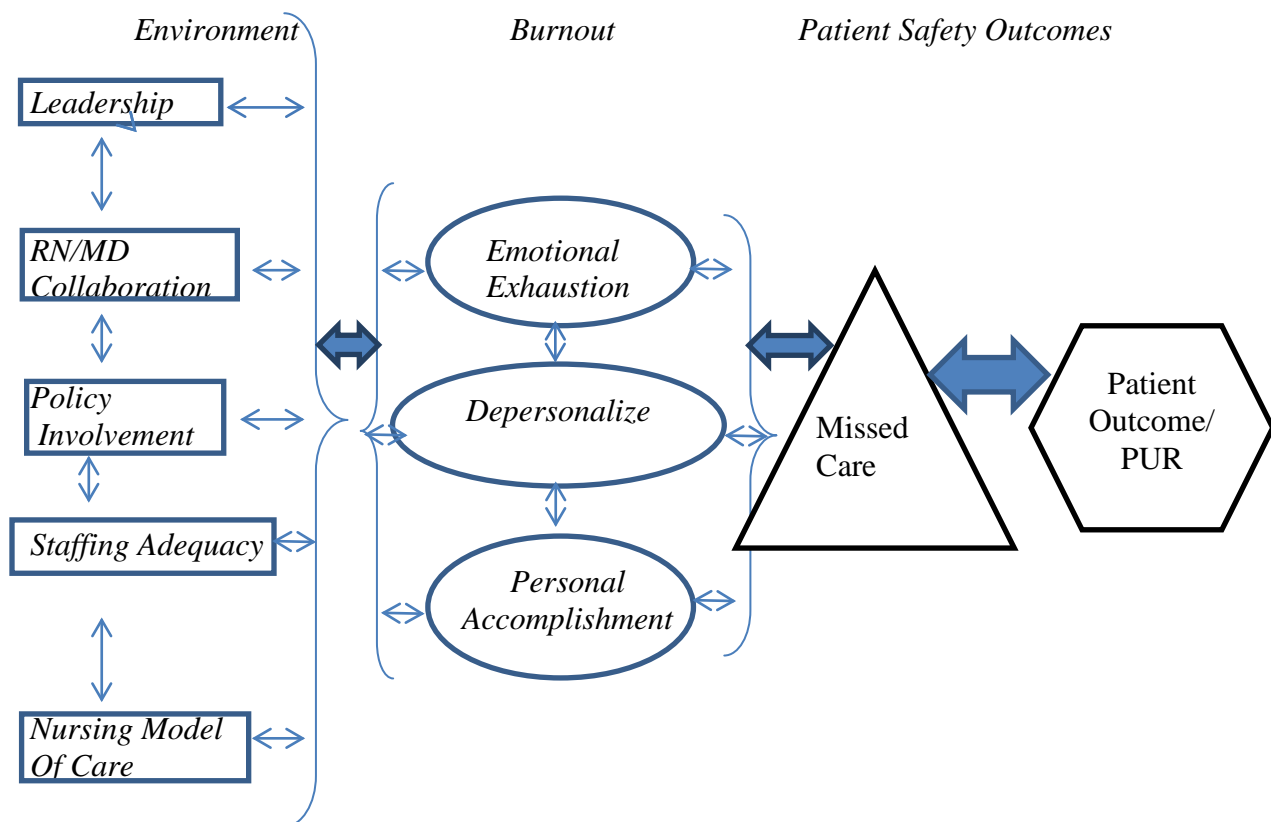


Figure 4. Future modified burnout mediation model for testing. Each factor in the environment (individually and collectively) influences each factor of burnout that, in turn, influences missed care and patient care outcomes. Complexity science appreciates the interactions of each factor but not necessarily in a linear fashion (depicted with bidirectional arrows). Patterns (within timeframes) identify the relationships of interactions. Adapted from “Final Model of Nursing Worklife with Mediating Burnout Role,” by H. Laschinger and M. Leiter, 2006, *Journal of Nursing Administration*, 36, p. 264. Copyright 2006 by Lippincott, Williams, and Wilkins/Wolters Kluwer Health. Reprinted with permission (see Appendix A).

## Complexity Science Perspective

In a complex system, the dominant Newtonian paradigm and reductionist belief that all relationships are linear is replaced with acceptance of unpredictability and nonlinear relationships. This new science of nonlinearity calls into question past research findings involving complex adaptive systems (CASs) that were based on statistical methods developed from the “predict and control” linear expectations of variables only. Each individual himself or herself is a CAS. Thus, the action or behavior of each CAS toward another CAS is independent

but adaptive to each other based on feedback loops (Anderson, 1999). For example, if a nurse always greets another nurse with facial expressions and body language that indicate she is open and ready for conversation, the other nurse typically will respond similarly, which forms a feedback loop that supports open communication. When this behavior is the unit or microsystem norm, the nurse, as a CAS, will adapt his or her behaviors based on prior experiences and, over time, self-organize to create and sustain the pattern of behavior that becomes part of the organizational culture.

In a CAS, the relationships between agents (in this study, individuals in the health-care system) serve as the primary forces that change an outcome or the environment. Creativity and innovation are produced through the self-organization or emergence of ideas influenced by the individuals' interactions, adjustments, and adaptations to the environment. In a complex system, small changes can make big differences; thus, uniformity would not enhance performance necessarily or exclusively in the complexity of patient care delivery. In normal statistics, the independence of variables is the foundational assumption of analysis and, thus, has questionable applicability to quantifying complex phenomena.

Building on previously learned information and evaluating responses of patients to treatment plans is the essence of the nursing care process. Nurses must care for patients as individuals and make adjustments as information is received and conditions are observed. Acknowledging these ever-changing conditions, the complexity of health care requires the full attention of nurses to care for and adapt to patient care needs. Worldwide recognition that patient care errors occur with some regularity and that the environment has a significant impact on patient outcomes is evidenced in the literature (IOM, 2004). Because of the stress of the work environment, nurse burnout has an impact of omission errors of care; nurses disengaged from

team members and patients could fail to recognize new information or feedback necessary to prevent omitted or missed care (Kalisch, 2006).

Complexity science views the interrelationships within the systems and suggests this proposed model for testing. Examining environmental factors that impact a system simultaneously, the complexity lens could add new knowledge about how the nurse providing patient care makes decisions. In health care, the unpredictable nature of patient needs and disease coupled with gathering information from a high number of variables has led to an increasingly complex nurse practice environment. Thus, using the complexity science lens in examining burnout and the impact on patient outcomes provides current and relevant ontology and epistemology of nursing practice that is open to emergence and the continuous changing environments of health-care delivery.

A better understanding may strengthen organizational designs for study and interventions to improve patient care. The specificity would enhance action research in organizations where members of the organization engage in careful self-reflection regarding concerns of the organization (social supports) and then collaboratively work to develop and test potential solutions.

### **Limitations**

The variables in this analysis explained only 1% to 3% of the variance in pressure ulcer prevalence rates, which is a very small effect. One explanation is that variables that impact that outcome were not measured by the NDNQI<sup>®</sup>. It was thought that both burnout and missed care would have a direct or indirect impact on pressure ulcer prevalence rates. Proxy measures from the NDNQI<sup>®</sup> database were used to measure both burnout and missed care. The positive and negative relationships that one would expect to find with both of the proxy measures were

substantiated with other variables in the model. However, the lack of a relationship between burnout and missed care with pressure ulcer prevalence rates cannot be assumed due to nonavailability of previously tested reliable and valid measures of burnout and missed care. Further testing of the model using other substantiated measures would be important in the future.

Pressure ulcer development for patients is multifactorial (Bergquist et al., 2013). The prevalence rate of pressure ulcers may not have been sensitive enough in this study to appreciate the dynamics of all of the multiple variables involved, and other variables of interest were not available for this secondary analysis.

Generalizability of the study findings is limited, first, by the selective nature of the NDNQI<sup>®</sup> hospital membership and, second, by the hospital sample of only medical and surgical units. The most notable difference between the medical facilities in the NDNQI<sup>®</sup> hospital sample is Magnet<sup>®</sup> designation. Within this sample, over 40% of the hospitals had attained Magnet<sup>®</sup> status. Overall, only 7% of hospitals in the United States have attained Magnet<sup>®</sup> status (ANCC Credential Organization/Magnet Program, n.d.). In addition, this sample would suggest that the NDNQI<sup>®</sup> hospitals are more focused on nurse environment factors and outcome measures as evidenced by their membership. The second concern with the sample is choosing only medical and surgical acute care units. This excludes critical care units and specialty units, limiting the review of patterns related to the variables and outcome variable.

The short longitudinal look (2 years) limits the assessment of the dynamics of the environmental complexity and responses to such in identifying patterns of change over time. Using more sophisticated analysis like structural equation modeling would lend itself to looking at the dynamic relationship between the variables.

Another study limitation is that the large sample yielded significant but very small correlations with the dependent variable at each stage of the model. Testing the model using more advanced statistical modeling procedures such as structural equation modeling may yield different results and would be appropriate using complexity science as a guiding framework.

### **Implications**

The aim of this study was to examine the relationships between environmental worklife indicators, nurse burnout, missed care, and the pressure ulcer prevalence rate. Expert practice has been previously defined as developing intuition from repetitive experiences with similar situations (Benner, 1884). Clinical decision making involves being able to critically think within a patient's unique situation. Examining and identifying patterns of interactions may provide knowledge and information to frame an understanding of nursing practice within the emerging environment to guide clinical decision-making.

Patient-centered care provides an opportunity for health-care professionals to consider the role of the patient and family as part of the care team; this goal is recommended as the guideline for care delivery by regulatory commissions (The Joint Commission, n.d.). It is the relationship between the human beings and the environment that serves as the primary force that changes an outcome (Turkel & Ray, 2004). Appreciating the impact of the environment and the patterns of interactions with the health-care professionals allows leaders in health care to focus on positive environmental factors and process development.

The staffing resource indicator was a major contributor to burnout, missed care, and pressure ulcer prevalence rate in 2012. Nurse staffing resources have a major influence on patient care as demonstrated in this study. Nurse leaders who develop and model a caring and reflective relationship with each staff nurse they manage would provide their staff nurses with

guiding principles on which to base their practice and, thus, directly influence nurse resource effectiveness.

### **Recommendations**

This study was the first step in a series of recommended studies to further the identification of patterns of interactions between the environment worklife indicators, burnout, missed care, and patient outcomes. This study identified and described relationships of the model variables over two different years using a large, national database. Further research is needed to continue to examine and to identify patterns of influence of the variables within the new proposed modified burnout mediation model (see Figure 4, p. 90) over a longer period of time and, perhaps, at intervals of time using structural equation modeling to examine further interaction relationships.

Another recommendation is to examine difference outcome variables that would look at different outcome parameters of patient care to identify patterns within the model. There are many outcome variables that are nurse sensitive and, thus, should be explored, such as patient falls, infection rates, and pain management.

Additional research on an ongoing basis to establish patterns of dynamically emerging variables and interactions of the environment and nurse practice patterns would add a wealth of new knowledge to the science of nurse caring. Ray (1994) described caring as complex choice-making occurring on the edge of chaos. This new knowledge would enhance our ability to understand holistic caring in complex nursing relationships and appreciate the changes that emerge. Consideration of research designs to include interventional action would add appreciation to the emerging concept of the complexity science framework.



Most obviously, further studies would expand the sample to include more hospitals and settings that are not biased by group sampling but are more reflective of the general population of settings. As health-care systems change settings and delivery models of care, such studies would be more contemporary and generalizable. Inclusion of multiple settings, such as critical care and specialty units, as well as ambulatory or home health settings, would expand the environment paradigm.

### **Conclusions**

Relationships between environmental factors, nurse burnout, missed care, and pressure ulcer prevalence rate were described in this study, appreciating the influence of hospital level (teaching status, region, size, and Magnet<sup>®</sup> status) and unit level (RNHPPD, RNHPPD/THPPD, BS or higher degrees, specialty certification, and total years worked on unit) parameters. All five domains of the Practice Environment Scale (PES) had significant relationships with the variables within the model. Although the linear weighted combination of the variables in the model explained only 1% to 3% of the variance in prevalence rate of pressure ulcers, the relationships among the variables within the model were noted and described. Most importantly, this was an introduction to future studies using the complexity science framework to appreciate the ever-changing health-care environment and interactions of relationships emerging. This introduction supports the development of targeted interventional research to continue to address patient safety and quality. In environments far from status quo, where cascades of change are continuously playing out and overlapping with one another, adaptation must be evolved. Adaptation is the passage of an organization through ongoing series of microstates that emerge from local interactions among the agents of the system trying to improve their local outcomes (Anderson, 1999). Thus, identifying the adaptation patterns will assist the leadership of the organizations to

implement adaptation programs to perhaps modify the direction and the boundaries with which solutions evolve for safer patient care.

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## Appendix A

### Permission to Use – Figure 1

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## **Appendix B**

### **Job Enjoyment Subscale**

The following items are general statements about job satisfaction. Please indicate the extent to which you think the nurses with whom you work most closely would agree or disagree with each of the statements.

Response options are (6) strongly agree, (5) agree, (4) tend to agree, (3) tend to disagree, (2) disagree, and (1) strongly disagree.

Nurses with whom I work would say that they:

1. Are fairly well satisfied with their jobs.
2. Would not consider taking another job.
3. Have to force themselves to come to work much of the time.
4. Are enthusiastic about their work almost every day.
5. Like their jobs better than the average worker does.
6. Feel that each day on their job will never end.
7. Find real enjoyment in their work.

## **Appendix C**

### **Miscellaneous Items from NDNQI<sup>®</sup> RN Survey**

Think about the last shift that you worked. Did any of the following situations occur?

Response options include no (2), yes (1), or NA (not applicable; 0).

1. I had enough help to lift or move patients.
2. I didn't have enough time to document care.
3. I had enough time to spend with each patient.
4. Inadequate staffing either prevented or resulted in patient admissions, transfers, or discharges.
5. Discharged patients (or their caregivers) were prepared adequately for home care.